Rock Products

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Vibrating Screens for Sand Plant

Brick and Concrete Sand Made at Low Cost by the Use of "Hum-mer" Electric Vibrating Screens

By A. W. Schmidt

Superintendent, Diamond Sand and Gravel Co., Bedford, Ohio

WE produce fine sand for brick, mortar and plaster work, and coarser sand for concrete work and we have the largest production of any sand and gravel company in the Cleveland district in the state of Ohio.

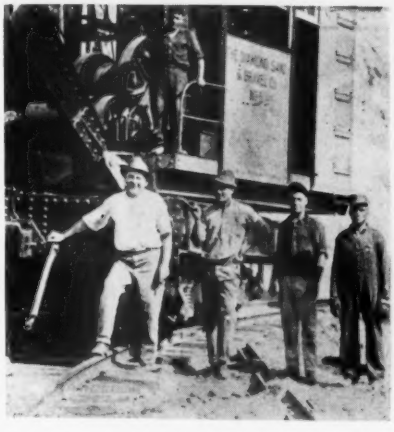
The plant is at Garfield Heights, Ohio, on the Pennsylvania railroad. The deposit covers between 45 and 55 acres. We are working a face 1500 ft. long and to a depth of 35 ft. below water level. The proportion of sand and gravel is about 50-50. The maximum size of gravel produced is 2-in. stuff. The plant has a capacity of 1500 tons per day with six men employed.

In 1922 we supplied all the sand for building the large concrete reservoir at Fairmont and Baldwin Road, which covers 40 acres and has a capacity of 165,000,000 gal. Our sand was selected in competition with sand produced from most of the pits in the neighborhood. It was subjected to careful tests at Ohio State University and at the Case School of Applied Science. The engineers passing on the material approved both our sand and also our method of producing it.

Sand that is used for brick mortar and for plastering must be absolutely within the dimensions specified. If it is larger than the maximum size allowed in brick mortar, the bricks cannot be laid smoothly because individual stones may be greater in diameter than the space ordinarily allowed between bricks. This means that the stone must be removed by the bricklayer, reducing his work capacity considerably.

In plastering it is even worse, because if one of these larger stones sticks out it will be struck by the plasterer's trowel, making a scratch across the surface of the work.

Plant B—Material is delivered to the feed hopper by steam shovel; then to two 4-ft. electric screens; then into bins and hauled away by trucks. The old plant may be seen in the background

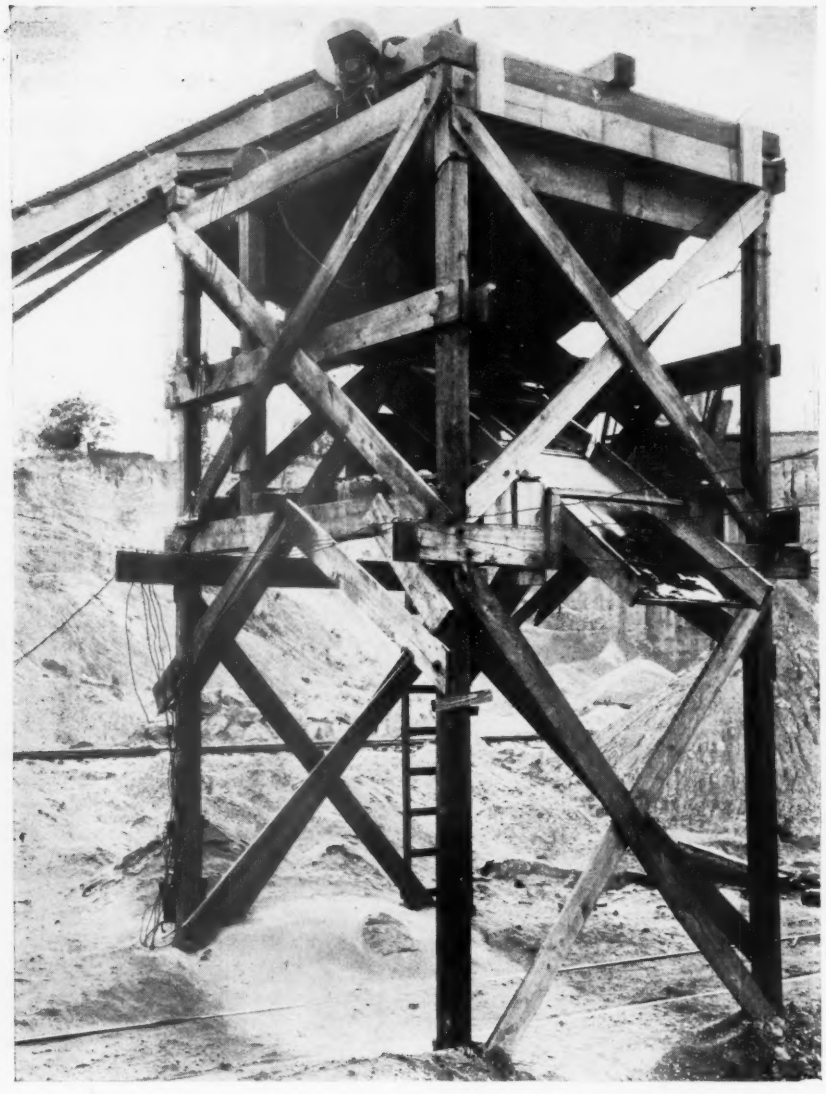


J. H. Schmidt, president, and A. W. Schmidt, superintendent, are first and second from the left

Three Hum-mers Now in Use

In July, 1921, we put in our first "Hummer" electric vibrating screen, which is now in plant A. It was a double surface screen, the top screen having 2-in. clear mesh, the lower screen 1-in. clear mesh. It was set at an angle of 30 deg.

This double screen enabled us to separate the material into three sizes: Larger than



Plant A—The finished product drops from Hum-mer directly into the cars

2-in., from 2-in. to 1-in., and from 1-in. down. Sand from 1 in. down is our concrete sand.

We were so pleased with the operation of this first screen that in March, 1922, we installed another in plant B, and added our third one in August of the same year. These last are single surface screens, with a 5/16-in. clear mesh, set at an angle of 35 deg. and are used for screening brick sand.

The high capacity of these Hum-mer screens is startling in comparison with rotary screens. With them we get 40 tons per screen per hour of brick sand and 100 tons per hour of concrete sand.

Our production is limited by the capacity of our excavating machinery and not by the screens. If we could feed the screens enough material, I believe that we could get as high as 75 tons of brick sand per screen per hour, and 250 tons of concrete sand; however, the figures first given are our standard rate of production.

Such a high capacity is possible with this type of screen because the electric vibrator causes it to operate at the rate of 900 vibrations per minute. It can also be drawn so tight that it sings like a violin string. Then every inch of the screen is vibrated, and the material goes through at the fastest possible rate.

At plant A we load from an Ohio locomotive crane, 50 ft. boom, 8-wheel standard gage, to a 4-yd. hopper over a conveyor belt which conveys the sand to the hopper over the screen. This conveyor is 82 ft. between centers, 18 in. wide and is speeded up to 320 ft. per minute. The size under 1 in., or concrete sand, drops into the railroad car below and the larger stone runs off to the side. We get about 10 per cent stone larger than 1 in.

The hopper is 10x12 ft. in opening and is equipped with a 5-in. bar grizzly.

At plant B we excavate the sand with another Ohio locomotive crane (4-wheel, wide gage) and load it directly into the 5-yd. hopper over the screen. The hopper at this plant is 12x12 ft. in area, and has a 5-in. grizzly bar screen. This brick sand is loaded into motor trucks as screened.

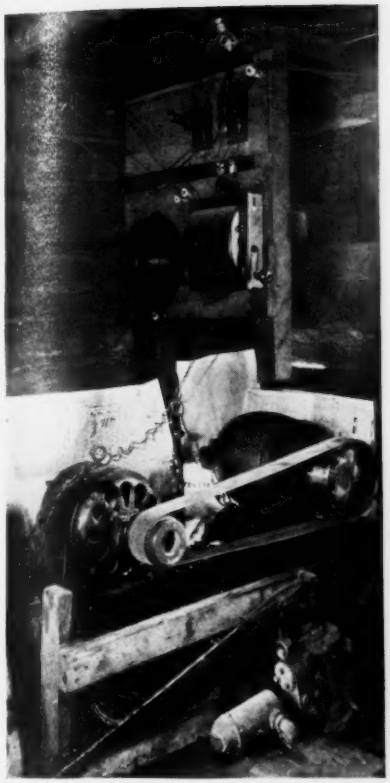
Four Times Rotary Screen Capacity

Doing our very best, we could get only one-fourth as much production from a rotary screen. Even to maintain that rate it was necessary to keep two men beating on the screen to dislodge pieces of stone that became wedged in the perforations; or else the production would fall to almost nothing in a short time.

We had men pounding the screens with baseball bats, and we used to wear out the bats at a tremendous rate. It was not a matter of light tapping, either—the man on the job had to work hard to keep the screen clear. It used to take 20 min. to fill a 5-yd. truck with brick sand, whereas with the Hum-mer we can do it easily in 5 min.

Under ordinary conditions our sand contains 3 per cent moisture. If weather conditions make the sand very wet, it is neces-

Plant A—The reciprocating feeder



The generator set used to drive all the screens at both plants. This equipment is installed in the tool shed. The feeder wires run overhead to the screens

sary to brush it through the screens; but it was impossible to get any wet material through the rotary screens.

The rotary screens were continually wearing out where the sections joined, and it took two days to replace the worn sections. If we ran without discovering the wear, larger material would slip into our sand and cause complaints from our users.

Plant B—A close-up view of the Hum-mer screening plant

We usually spent about $200 a year for repairs and maintenance on the rotary screens. Another item of greater expense was power, as it took about 5 hp. to revolve the screens we formerly used.

We figure a rotary screen costs $15.09 a day to operate. As its maximum capacity is 100 tons of brick sand per day, or 250 tons of concrete sand, the cost per ton was 15.09 cents for brick sand and 6.04 cents for concrete sand.

Screening Costs 1/10 to 1 Cent

When we installed the Hum-mer screens we got away from all these troubles and increased our capacity so that we can now get production to take care of our orders. About the only attention necessary with these screens is to replace the screen surfaces twice a year. This is a 10-min. job.

In figuring the cost of operating the

Plant A—Material delivered to the reciprocating feeder by steam shovel, thence to electric screen by belt conveyor. The screen is equipped with a grizzly

screens we depreciate them on a basis of 10 years' life, and allow $50 a year for repairs and maintenance. This is high, and includes new screens as needed. The only power required is for driving the generator which supplies the current for the vibrator.

On the brick sand screen one man takes care of the flow of the sand to both screens, so we charge one-half of his time against each screen. No labor is required on the concrete sand screen.

The cost for the brick sand screens is $3.98 per day each, or 1 cent per ton. The cost for the concrete sand screen is $1.03 per day, or 10 cents per ton. These are *screening costs* only, and do not include the cost of excavating, stripping or general overhead.

We estimate it would take 12 rotary screens to do the work handled by our three Hum-mer screens, therefore they are saving us a total of $172.12 per day in screening cost on the standard production of our plant.

There is also a saving of 75 per cent in truck time, due to our faster loading ability. While this saving does not directly affect us, it makes considerable difference to the men hauling the sand.

We consider these the best screens in the world for sand.

J. H. Schmidt is president of the Diamond Sand and Gravel Co.; L. M. Schmidt is vice-president; A. P. Schmidt, secretary and treasurer, and the writer is superintendent—father, mother, daughter and son.

Cost of Operating Rotary Screens

Depreciation—$500.00 ÷ 10 yr. life	$ 50.00
*Average interest at 6%—11/10 x $\frac{\$500.00 \times .06}{2}$	16.50
Annual maintenance and repairs, estimated	200.00
Total annual fixed expense	$266.50
Fixed expense per day—$266.50 ÷ 300 days	.89
Power—4.39 kw. x 10 hr. at $0.05 per kw. hr.	2.20
Labor—2 men at $6.00 per day	12.00
Total cost per day	$ 15.09
Cost per ton of brick sand—$15.09 ÷ 100 tons	$ .1509
Cost per ton of concrete sand—$15.09 ÷ 250 tons	.0604

Saving of Hum-mer over Rotary Screen

Saving per ton of brick sand—$.1509 — $.0100	$ .1409
Saving per ton of concrete sand—$.0604 — $.0010	.0594
Saving per day on brick sand—$.1409 per ton x 800 tons (production of 2 screens)	$112.72
Saving per day on concrete sand—$.0594 per ton x 1000 tons	59.40
Total daily saving	$172.12

*Allowing for interest credited on depreciation fund.

Cost of Operating "Hum-mer" Screens for Brick Sand

Depreciation—$845.00 ÷ 10 yr. life	$ 84.50
*Average interest at 6%—11/10 x $\frac{\$845.00 \times .06}{2}$	27.88
Annual maintenance and repairs, estimated	50.00
Total annual fixed expense	$162.38
Fixed expense per day—$162.38 ÷ 300 days	.54
Power—⅓ x 2.63 kw. x 10 hr. at $0.05 per kw. hr.	.44
Labor—½ of one man's time at $6.00 per day	3.00
Total cost per day	$ 3.98
Screening cost per ton of brick sand—$3.98 ÷ 400 tons	$.0100

Cost of Operating Hum-mer Screen for Concrete Sand

Depreciation—$950.00 ÷ 10 yr. life	$ 95.00
*Average interest at 6%—11/10 x $\frac{\$950.00 \times .06}{2}$	31.35
Annual maintenance and repairs, estimated	50.00
Total annual fixed expense	$176.35
Fixed expense per day—$176.35 ÷ 300 days	.59
Power—⅓ x 2.63 kw. x 10 hr. at $0.05 per kw. hr.	.44
Labor	0.00
Total cost per day	$ 1.03
Screening cost per ton of concrete sand—$1.03 ÷ 1000 tons	$ .0010

*Allowing for interest credited on depreciation fund.

Federal Aid Designated in 34 States

ROADS that will comprise the federal-aid system of highways have been designated in 34 states, according to the Bureau of Public Roads. A study of the system in the states approved shows some interesting facts.

Nearly every city of over 5000 population is located upon it and the few that are not will connect with it over improved roads. Indications are that over 90 per cent of the entire population of the United States will live within 10 miles of a federal-aid highway. In a number of states the figure is as high as 98 per cent and in none of the states will it drop below 65 per cent.

The following tabulation shows the mileage by states, estimates being given for those whose systems are not yet approved:

	Federal-aid system
Alabama	3,958*
Arizona	1,498
Arkansas	5,037*
California	4,467
Colorado	3,360
Connecticut	835
Delaware	266
Florida	1,855
Georgia	5,662*
Idaho	2,772
Illinois	4,987*
Indiana	3,957
Iowa	7,154
Kansas	6,423
Kentucky	3,250
Louisiana	2,667*
Maine	1,393
Maryland	1,036
Massachusetts	1,290*
Michigan	4,582
Minnesota	6,801
Mississippi	3,290*
Missouri	7,040
Montana	4,697
Nebraska	5,500
Nevada	1,456
New Hampshire	988
New Jersey	983
New Mexico	3,258
New York	4,498
North Carolina	3,816
North Dakota	4,855*
Ohio	4,506
Oklahoma	7,889*
Oregon	2,814
Pennsylvania	3,954
Rhode Island	165
South Carolina	3,179*
South Dakota	8,077*
Tennessee	4,564*
Texas	11,655*
Utah	1,430
Vermont	1,043
Virginia	3,016
Washington	2,887
West Virginia	1,901
Wisconsin	5,516*
Wyoming	3,234
Total	187,406

*Mileage given is an estimate, as system is not yet approved.

Cement Industry Anticipating Market's Demands

PORTLAND cement as an industry, says the *Dow Service Price Supplement*, started out to anticipate the demand for basic building materials by utilizing as much capacity as possible. According to the U. S. Geological Survey, a much larger part of the year's requirements for portland cement in building and road construction has been produced and shipped than in any previous year. The increase over last year in production was more than 40 per cent for the identical period. Shipments up to May 31 exceeded shipments for the same month last year by 14,000,000 bbl.

In analyzing this excessive shipment the Geological Survey expresses the belief that a considerable part of this total represents shipments that otherwise would be called for later in the year when the demand is usually greater and delivery less certain on account of crop movements and increase in business generally. Cement interests, believe, however, that it is due to their anticipation of the public's need for cement this year, pointing by way of proof that there are many mills entirely sold up for the year and some of the smaller plants are doing a business at the present time 12 per cent beyond anything they have ever experienced.

The exhibits offered by lumber and structural steel show that the cost of building construction is slowing up the demand for fabricated shop capacity as far as building construction is concerned, and the lumber dealers are not moving their stocks sufficiently fast to force them back to the mills for more stock in the light of rising construction costs, not only in New York City but throughout the country.

British Quarry Owners' First Annual Federation Meeting

Absolute Co-ordination of the Government, the Owner, and Labor Enables Their Problems to be Successfully Debated

AT a special meeting of the National Federation of Granite and Roadstone Quarry Owners, held at the Hotel Russell, London, states the *Stone Trades Journal* (London), Chairman E. J. Burt said that the assemblage had been invited to attend "the first of what it is hoped will be a long series of annual meetings of all the members of our federation. It has been felt for some time that it was desirable for us to have a general meeting once a year at which the chairman can explain the work of the past year, and for a general friendly discussion of all matters of interest."

Mr. Burt's address follows:

I propose to address you on the general organization and history of this federation, and of the allied bodies connected with it, and which have been called into being in the last few years as an answer to the new situation in the industrial world created by the war. The amount of work which has been successfully carried out by the members of the council has been every considerable, and I have had a chart prepared which I think will be found essential to a proper understanding of the relationships and growth of the various bodies which have been formed in connection with our own.

If you think fit, I should suggest that this chart might be printed and circulated to members as a small colored diagram, because without such a guide it is difficult for members to realize that the Granite and Roadstone Federation is not a single body, but an integral part of a vast and complicated organization which has been formed as a result of the new conditions created by the Great War.

I think you will agree with me that the planning and developing of this whole organization has made great demands on the time, thought, and patience of the active members who have worked on the various committees and councils which have been called into being.

It is difficult to say which of the bodies shown on this chart were the first to come into being, as they are interdependent and were each created out of the other. I think I may claim that I was one of the first to see the real necessity of the quarry owners organizing themselves, and it was I who suggested a meeting of some of the older quarry owners as a first step, in the spring of 1918. This meeting was quickly followed by subsequent meetings held at Crewe, where the Road Stone Quarry Organization began to take form.

Ministry of Labor Takes a Hand

At about this time the Ministry of Labor set up "interim committees" with a chairman appointed by the government to form a center to organize each industry, with the arrangement that, if an industry could or would not organize itself as a joint industrial council under the Whitley Scheme, it could and probably would be included in the Trade Boards act, which would not have been so agreeable a solution for the quarry industry.

At first the government insisted on a single National Joint Industrial Council for the whole quarry industry, and would not admit that there were any difficulties in the combining and coalescing of such widely differing sectors of the trade, and one of our greatest difficulties at the commencement was that, when we met as employers and labor representatives, we, the employers, found that we were not in agreement as to the suggestions which were brought forward. It was therefore necessary for us to arrange to meet as employers beforehand in order to come to a unanimous decision as to the attitude we would take in the National Joint Industrial Council, which, of course, included labor.

The government insisted, although we strongly opposed it, on our organizing from the top, the National Joint Industrial Council, downward, and we found that it was necessary to form one national council which should in itself consist of five other national joint industrial councils, one for each branch, or section, of the industry: lime and limestone, granite and roadstone, freestone, slate, and chalk.

During the formation of these bodies it was found necessary to form, or to take in where already formed, similarly divided bodies of employers, which provide the employer's side of the industrial council of their industry, and the Granite and Roadstone Federation was so called into being.

We then had arrived at the position where there were two separate classes of council for the whole quarry industry: Joint councils, that is, employer and labor; employers sitting together in the form of five national federations without any co-ordinating constitution.

Here we met the same difficulty which had faced us all along, and we found it was necessary to form the five employers' federations into one head federation in order to obtain united action on the part of the five. This led to the eventful formation of the body shown on the chart as "The Federated Quarry Owners of Great Britain."

You will see on the chart that the organization may be said to be fully planned, and practically complete in arrangement and organization. In the two larger sections, granite and limestone, we have a complete connection of district point councils and employers' councils which form the two national sectional bodies, and which again form part of the main national bodies, so that at every stage any question can be debated both by the employers separately and also by a joint council or committee.

Practical Organization

This organization has been found to be the most practical form in which the industry can be organized, and, unlike most other industries, we have a great advantage in the fact that at each stage, whether district, national, or in the head body, the same employers' representatives who form the council, board or committee of the employers' federation, also are members of the corresponding Joint Industrial Council, whereas, in many other industries, they are different men.

This has the advantage that it is possible for the employers to meet in the morning and arrive at an agreed opinion on any questions which are coming up for discussion at the joint council meeting.

As the government insist on one national joint industrial council for the whole of the quarry trade in spite of the wide differences which exist in the conditions of working, etc., obtaining in the five sections, the Federated Quarry Owners has been proved to be a necessity, and I am glad to say that a great deal of valuable work has been done by this body, particularly in relation to the railway classification and other questions, and that this unity of organization means that we have great strength, as the government departments now fully realize that "quarries" are a fully organized trade, and can form and express their opinions and decisions apart from "mines," whereas before the war, quarries were simply tacked on to the Mines Department, and barely considered by the government as a separate trade with problems peculiarly its own.

Above the Quarry Federations I have placed the Confederation of Employers' Organizations, and I now propose to tell you something of the development of this most important body, as I think that some of the members hardly realize that we are members, and the enormous use and influence that this body possesses.

The Confederation of Employers' Organizations was formed as a result of the Provisional Joint Industrial Conference which was called into being by the late Prime Minister Lloyd George, to discuss the problems of "The Causes of Industrial Unrest and the Remedy," directly after the armistice. Here again, it was found difficult for the employers to attend the meetings and show a united front unless they had met previously for free discussion. In consequence, a committee was formed of the employers' side of the conference, representing some 30 different industries, which in due course became the Confederation of Employers' Organizations, on the council of which I am your representative. T. M. Ryan, of the lime and limestone industry, is my fellow delegate to this body from the Federated Quarry Owners.

This confederation, whose president is Lord Weir, is now recognized by the Cabinet and the Ministries as the authoritative body for the consultation on proposed new acts, and amendments to orders in council, etc., on all matters which are concerned with labor and labor problems.

On the left of the chart I have shown the Federation of British Industries. After much negotiation, the Confederation and the Federation of British Industries have come to the understanding that the latter body takes as its special province all questions which are purely or mainly commercial, and the Joint Committee, as shown, exists in order to maintain touch between the two bodies for co-operative action when desirable.

Membership of the confederation is restricted to federations strictly, and, where the association applying for membership is part of a larger federation, only the head, or supreme body, can be admitted to membership. This proviso is undeniably a wise precaution, as it prevents duplication of representation, and also restrains the confederation from becoming too unwieldy for working purposes.

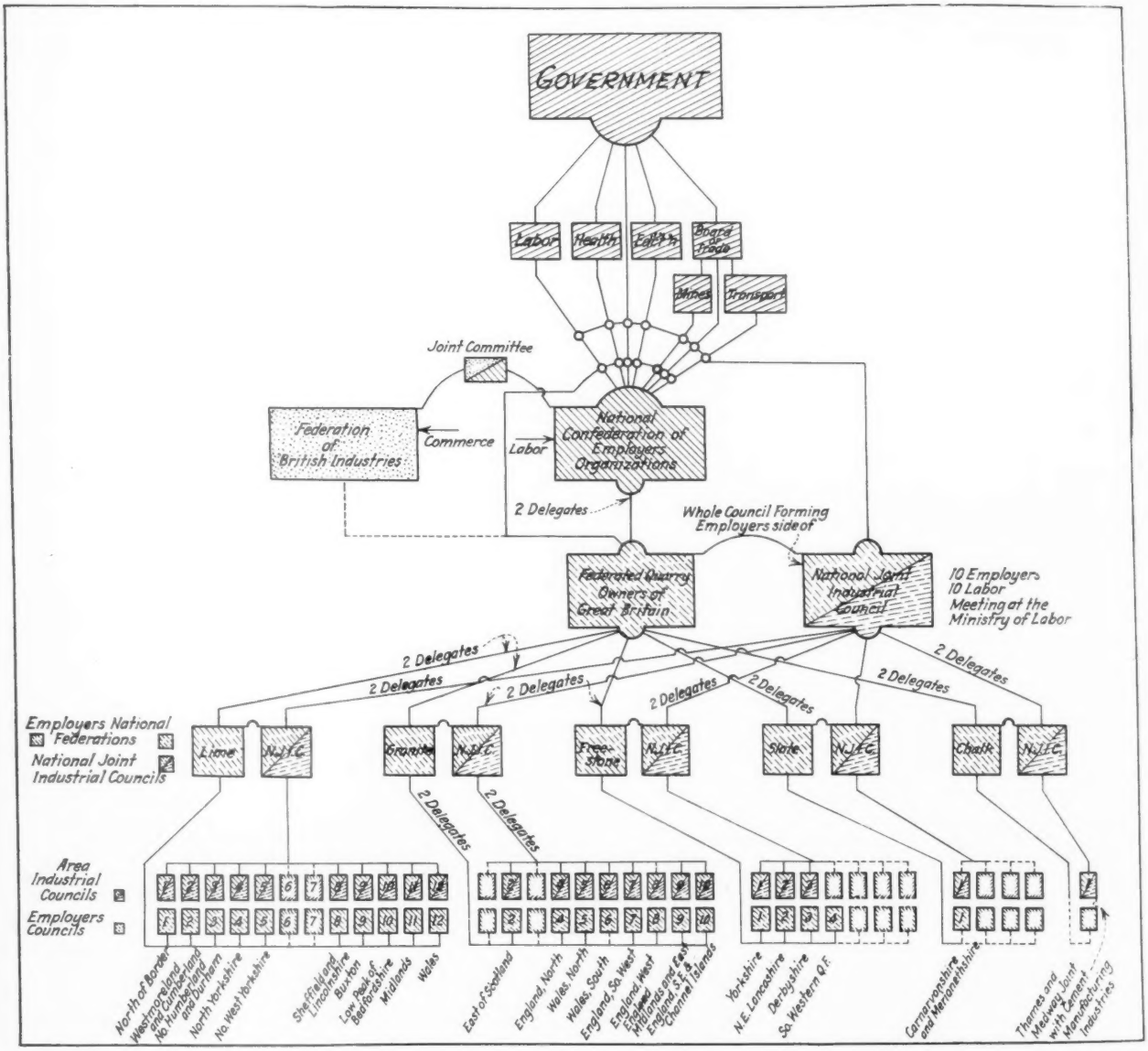
The field covered by the confederation is very wide so let me mention a few of the main industries which are members: Mining, engineering, iron and steel, shipbuilding, shipowners, cotton, chemicals, quarries, civil engineering contractors, and a large number of other trade associations in a great variety of industries.

Owing to the sessions of the International Labor Conference at Geneva and other causes, the work of this body grows daily in importance. If I had room, it would be possible to extend this chart to show the relations of the Confederation of Employers' Organizations with the International labor offices at Geneva, and the 20 or so other associations which are in intercommunication, but you will readily understand that the ramifications of so large a body are so complicated that it is almost impossible to explain them all in detail in the short time I have at my disposal.

Enormous Influence Developed

I think that I have now sufficiently covered the general inter-organizations of the quarry trade to demonstrate to you the enormous influence and power which this carefully developed system of mutual federation has put within our reach. You will realize that our federation is thus kept in touch and has access to the ministries and government, and also, through one channel or another, the national and international organization of Europe and America.

One point which I hope this explanation of mine will emphasize and bring home to you is that, owing to the fact that the



This chart, reproduced from the British "Stone Trades Journal," shows that the Granite and Roadstone Federation is an integral part of a huge, complicated organization

ministries and governments, when they consult the confederation, usually demand a reply at short notice, and cannot give the time sufficient for a complete and general discussion of every point and question by all members of the allied associations those whom you appoint as chairmen and members of your councils have had, and most frequently will have, grave responsibilities thrust upon them, and frequently are compelled to decide at short notice on grave and difficult questions. It is essential that you should repose ample trust and power in those whom you select as your representatives.

"What Do We Get for Our Money?"

You may be saying sometimes to yourselves that this all looks very nice and impressive, but, "What do we get for our money?" This is a fair question, and I will try to give you an answer to the best of my capacity.

I want you to realize that the whole organization you see here depicted is the growth of only four years' work, and that it is only reasonable to admit that it is still early to expect to see the full fruits of so vast a growth, but, and this is no small gain in itself, four years ago there was no National Organization of Employers and Employes working together in peace and friendship to brush away the cobwebs of suspicion and discontent spun largely by mere ignorance of each other.

It is only after we have met for a few times that we begin to realize how much there is to discuss, sift, and examine. Members who do not attend the council meetings would hardly be able to imagine the quantity of work that has to be done and the number of questions on which an expression of opinion is wanted from one side or another.

Won in the Teeth of Misunderstanding

I think that, when you realize that the whole organization shown on this chart has really sprung up within four years, and that this work was done, not with co-operation of all parties, but in the teeth of a great deal of misunderstanding, jealousies of existing associations, trade jealousies of trade unions against each other, with the Ministry of Labor insisting all the time on our doing the impossible and organizing from the top downward, and founding a joint council before the bodies to be conjoined, I think that you will admit that the organization alone, apart from any useful work which may have been achieved, has been a long and hard task, and, not only as your chairman, but as the president of the Federated Quarry Owners, my work in this respect has been very heavy.

The Important Questions

I will mention the more important questions that the board has had before it, and I think you will admit, without going into detail in each case, that the results accomplished in themselves sufficiently warrant the federation's existence.

Demobilization of pivotal men, shortage of railway wagons, chamber of shipping—Panstone charter, roadstone control board, trade disputes, reductions in wages, double brakes on private wagons, municipal trading, standard specifications, silicosis, quarry rules, railway classification.

Further questions are still raised from time to time in connection with the conditions of carriage, with which the council of the Federated Quarry Owners is dealing at its next meeting.

I think you will agree with me that this brief list, which by no means exhausts the work which has been done by the federation, suffices to show that the board is fully alive to the requirements of the trade. I cannot too much emphasize the necessity of our maintaining ourselves in a properly organized condition to prevent the industry from being overloaded by unnecessary regulations and excessive impositions.

Proceedings of the British Institution of Quarry Managers

Some Excerpts of Interest to Quarry Men Everywhere

THROUGH the courtesy of S. McPherson, honorary general secretary of the Institution of Quarry Managers of Great Britain, we are enabled to have an advance copy of the proceedings of their recent annual convention at Llandudno, North Wales. According to all accounts the British quarry men enjoyed their "conference" in the good old-fashioned way, as well as profiting by some very excellent papers and addresses.

Many of the papers, of course, were chiefly of local interest, but we have culled the following excerpts as of interest to quarry men everywhere.

Slate Men in Association

Through the efforts of the Festiniog District Slate Quarry Proprietors' Association the producers of "Portmadoc" roofing slate are reaching outputs of pre-war days. The substance of their sales argument is this:

In judging the qualities of a building stone of any kind, by far the most satisfactory and possibly conclusive tests, are, of course, those obtained in actual experience of its use. Such subtle differences exist in the structure and composition of stone (slates of course included) that no series of laboratory tests can give one the same assurance as is derived from the observation of buildings on which the material in question has actually fulfilled its proper functions, with credit, over a long period. Where a material has been on the market for a long period, the first testimonial that should be required of it is that provided by the buildings on which it has been employed, and it should not be accepted unless it can be shown that it has a sound record behind it. Portmadoc slate having been employed in tremendous quantities, both at home and abroad for upwards of a century, can of course produce innumerable testimonials of the sort required.—E. Andrewes, General Manager of the Maen Offeren Slate Quarry Co., Ltd.

Publicity and Advertising

S. McPherson, honorary general secretary, himself a prominent quarry man, made some pertinent remarks about advertising and publicity that were based on his own experience with equipment manufacturers' methods. He said: "I have received a few nicely got up booklets on quarries, but although they are interesting at the time, since the busy man has glanced through the booklet it is probably put away amongst others, and it may or may not be ever looked at again. I like systematic advertising." He continued further on:

If the quarry I was made president of was a limestone quarry, I'd send every farmer a monthly circular telling him when the sun rises; what sort of weather we are going to have (or ought to have); why hens lay eggs and cows give milk; how to fatten pigs on sawdust, and how much water one could put in the milk without being detected. And if it was the farmers in Yorkshire I was circularizing, I'd tell them that the wheat crop in Lancashire had been the heaviest ever known because the Lancashire farmers had used

"Mac's Limeco for Liming the Land."

I'd pester every farmer with the word "Limeco" until they got it so much into their heads that they would be apt in the evening to call for a pint of "Limeco" in mistake for their usual ginger ale.

My opinion is that the publicity side of the quarrying business is woefully neglected, more so than any other business I know. I have my own ideas of the reason for this, but they need not be given here; only I do suggest that it is urgently necessary that this should be altered.

Salesmanship

American business men will be interested observers of how completely the modern *service* idea is taking hold on the other side of the pond. G. H. R. Menham, speaking on salesmanship, said:

Good salesmen should be, and indeed it is my own experience that many are, of great assistance to buyers. Unfortunately many do not know their business, and this explains much. Many salesmen have absolutely not the faintest idea as to how the goods they push are manufactured, and as I have pointed out before, whether you are selling stone, leather, pickles, or doll's eyes, it is a decided advantage to have some idea how these commodities are produced and to what specific uses they can be applied.

Buyers and sellers alike must realize that we have entered on a new business era, new alike as to business methods and the type of men engaged in business.

A Study of Lime Kilns

VII. Need of Heat Control to Effect Fuel and Labor Economies

By Arthur E. Truesdell
Consulting Engineer, Pittsfield, Mass.

FROM the preceeding discussion of the nature of heating required in a lime kiln and the losses of heat in its operation, it would seem that observations of temperature would be indispensable to the proper control of a kiln. At most plants, however, temperature is never thought of, or guessed at, by the burner from observations with his eye. Knowing from experience that his eye is a poor thermometer, he falls back on the condition of the kiln as disclosed when drawing and bases his future action thereon. This is also a poor method, as many times it involves guesswork, with inferior lime for a result. A recording pyrometer should be placed on every lime kiln. This instrument will steer the kiln as a compass steers a ship.

High Fuel Consumption

It may also be said that heretofore too little attention generally has been paid to conserving fuel. With the rising prices of fuel comes the necessity for using it carefully and cutting out all wastes possible. We have shown many places contributing to low efficiency of heating, the chief of which are defective combustion, excess air in furnaces, high radiation and often ignorant handling. Not only should the lime kiln have a pyrometer for heat control, but also apparatus for gas analysis.

The superintendent should have some knowledge of combustion and be able to make simple gas analyses from time to time in order to check up the efficiency of the combustion. This is not at all difficult as the Orsat apparatus is easily manipulated to give positive results and not expensive to buy or operate. Determinations made weekly of oxygen or carbon monoxide in the waste gases will show improvement or otherwise in furnace operation. While the observations made will not correct inherent defects of furnace design or combustion methods, they will enable the operator to get the most out of his kiln, which sometimes means a lot.

Ash

The commercial requirement for a clean white lime with no "core" or unslakable lumps imposes on most manufacturers the necessity for using a kiln where the product is not contaminated with ash.

It is quite probable that such contamination in the use of pulverized coal is too slight for serious attention. An estimate of the amount of this finely divided powder in the product, assuming that none is retained in the furnace or carried out by the draft, follows:

> Taking a coal consumption of 1 lb. per 5 lb. of lime and the ash content of the coal as 10%, gives 1/10 lb. ash per 5 lb. of lime, equivalent to 1 lb. ash per 50 lb. of lime, equivalent to 5.6 lb. ash per 280 lb. of lime (1 barrel).

Such an amount would be hard to detect even by analysis, as commercial limes are impure oxides anyway; or by the eye, unless the ash was highly colored by the presence of iron, which could be easily avoided by proper specifications for the fuel. In the old days wood ashes often found their way into the lime to some extent without causing trouble.

Labor

Low operating costs dictate, besides fuel economy, an efficient handling of stone, lime, fuel and ashes, thus minimizing labor costs. The recent uncompromising attiture of labor and its growing scarcity are leading prominent manufacturers to install extensive mechanical equipment to reduce this cost. In view of changing conditions, where we may have further deflation and constantly declining prices on the average over the coming 10 to 15 years, the initial cost of such an equipment must be carefully considered before installing. The fixed charges on the plant (interest, depreciation, insurance, taxes and repairs) may be increased thereby, enough to run our lime cost per ton to an excessive figure, notwithstanding the saving in labor cost; especially at such plants as have small demand or greatly variable demand in comparison with kiln capacity. While it may be possible in some plants to over-equip, in many others marked economy may result in the installation of moderately priced devices at vital points. The advice of experienced engineers is valuable at such times.

Fixed Charges

Economists tell us that we are approaching a period of slowly declining prices of commodities. If so, it behooves the lime manufacturer to scan closely all his operating costs, and in particular the fixed charges for interest on capital, taxes, insurance and depreciation. There is always a temptation to slight these costs, especially proper charges for depreciation of structures and machinery and depletion of quarry. These costs are all real, if hidden, and must be paid sooner or later.

As an illustration, let us figure a rough comparison of the fixed charges between a modern electrically driven rotary kiln plant, complete with crushers, tanks, etc., and housed in steel buildings; with a vertical kiln, old-style plant, housed in cheap wooden construction. Both plants have a capacity of 60 tons per day and operating 300 days per year.

COST OF PLANT

	Rotary	Vertical
Kilns	24,000.00	35,000.00
Machinery	36,000.00	.....
Steel buildings	30,000.00	.....
Wooden buildings	.....	15,000.00
Capital invested	90,000.00	50,000.00

FIXED CHARGES

Interest at 6%	5,400.00	3,000.00
Taxes; 2% on ½ capital	900.00	500.00
Insurance		
1% on steel	300.00	.....
5% on wood	.....	750.00
Depreciation		
10% on machinery		
8% on kilns		
6% on wood blds.		
4% on steel blds.	6,720.00	3,700.00
Total, annual fixed charges	13,320.00	7,950.00
Total, annual fixed charges per ton	0.74	0.44

The rotary plant will have to produce lime 30 cents per ton cheaper than the vertical plant to take care of its fixed charges alone. This is not an argument against expensive equipment as such, as many times it is justified; but to bring out the necessity of carefully and fully weighing the fixed charges whenever proposing a sizable investment in equipment. It also serves to emphasize the desirability of building up reserves to care for depreciation.

Summary of Major Requirements

In reviewing our discussion we can now assemble the more desirable elements in a lime kiln with their contributing features. These are:

For Universality:

(a) Ability to burn either hard or soft stone.

For Quality:

(b) Absence of ash in the lime.
(c) Uniform heating.
(d) Low temperature operation.

For High Output:

(e) Good draft.
(c) Uniform heating.
(f) Steam in combustion gases.
(g) Small sized stone.

For Low Fuel Cost:

(h) Minimum discharge gases.
(i) Cool discharge gases.
(j) Cool lime.
(k) Low radiation from kiln.
(l) Easy lime discharge.
(g) Small sized stone.

For Low Labor Cost:

(m) Easy kiln charging.
(l) Easy kiln discharging.
(n) Easy fuel and ash handling.

For Low Repair Cost:

(d) Low temperature operation.
(i) Cool discharge gases.
(j) Cool lime.
(g) Small sized stone.

For Low Fixed Charges:

(o) Low investment.

(To be continued)

Cost Finding and Its Problems in the Sand, Gravel and Quarry Industries

III—The Basis and Classification of Costs in the Sand and Gravel Industry

By Alfred Baruch
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IN laying the foundation of a cost system it is very important to establish the proper basis for finding the cost. By this is meant the units upon which cost is figured. The man who digs only one kind of sand would have no difficulty in finding the gross cost of his products. All he needs to do is to find accurately the cost of one ton, and then the basis for his price is established. Of course, this will not give him any comparison of the individual expenses, but it will tell him what to charge. If he finds his price is too high, he will have to make a closer analysis of his costs in order to discover where he may cut the price in order to meet competition.

But the case of the operator who turns out more than one product is different. Suppose such a man has a washing plant for coarse sand and gravel, and in addition is digging fine sand for dry screening. Unless he has an adequate cost system this operator's troubles begin from the time he digs the sand until he collects the money which represents his earnings.

He probably bought the sand bank for a lump sum, but he cannot put the same cost figure on gravel that he does on coarse sand or that he does on the fine dry-screened sand. If he does this he will find that purchasers of his wares will make heavy demands on the higher grade of sand that is selling at the uniform price and leave him with the cheaper grade of sand when he has stripped his bank of the good sand.

If a man is producing gravel, coarse and fine sand, he cannot take the total tons produced and divide them into the total cost to arrive at the price per ton. The cost of the sand and of washing and screening are sure to be different, even when the cost of digging is the same.

The Proper Basis for Figuring Sand Costs

The proper basis for figuring costs in sand digging is the gross tonnage produced when the operator turns out only one kind of material, such as coarse sand. When the products vary the only basis possible is a special rate for each product and this rate is arrived at by dividing the whole operation into production centers.

By this system every separate operation is made a production center or, for all practical purposes, a plant by itself. Through a system of symbols, or numbers, all the charges that can be made against this particular operation are accumulated against it and the total cost is divided into each unit on the basis of time.

For example, digging the sand would be a production center. If all digging is done in the same place and in the same way, then every ton would cost exactly the same to mine. But if one stratum is near the surface and easily accessible and the whole layer is exposed so that no coarse sand need be cleared away before this particular variety can be taken out, the cost per ton may be quite low. If another stratum is much below the surface and reaching it involves considerable preparation, the cost per ton may be much higher. If there is a variation in the cost of digging a ton of sand, this difference must appear in the cost figures and two or more production centers will have to be established in place of one. The cost of transporting the sand to the screen should be added to the cost of digging.

The next production center is the screen itself. Here the coarse sand is washed and screened and the fine sand is dry screened. Therefore the cost per ton of fine sand would be quite different than the cost per ton of the coarse sand. Where other products are produced, the corresponding equipment is made the production center. For the sake of illustration, we will assume that one center is the steam shovel. The cost per hour of operation is determined and then the number of tons of each kind produced per hour is divided into this cost to arrive at the individual cost per ton.

The same procedure would be followed with the loading. The cost of this operation per hour is predetermined and then the length of time of loading each product determines the cost per product.

However, it is not enough to find the cost of each ton. It is also necessary to get a report of the sum of all operations into the general records. This is done by classifying all activities and transactions of the plant and by collecting them under proper groups. These groups are known as the General Accounts, and the records of all work, all expenditures, all income, must find their way into the general accounts in some manner or another.

Accounts Fall into Two General Classes

An examination of the accounts will show that they fall into two general classes, namely: those accounts which are permanent in their nature and remain on the books permanently as open accounts, and those accounts which are open at the start of any production period and closed

at its completion. In other words, those accounts that have to do directly with production are of a temporary nature, and those that have to do with the plant itself are of a permanent nature.

It is very important, therefore, in laying out a cost system for quarrymen, to make a careful study of all the transactions that involve operating a sand bank or a quarry, and to classify these transactions in their logical order. This classification depends upon the kind of information desired on the balance sheet. In a small plant there would be fewer classifications, more of the expenses being grouped under one head because of the small amounts involved. In a larger plant the classification would be in greater detail, but it would follow the same general principle as those of the small plant.

Classification Accounts of a Small Plant

The following description of the classification accounts is based upon a small plant, it being understood that where the classification is not in sufficient detail for a larger plant, further refinements can be made:

The General Classes—In general, all accounts of the average quarryman's plant may be divided into:

1. The Asset Accounts, or those accounts representing the property and possessions of the operator.
2. The Liability Accounts, or those accounts which represent the liabilities or debts.
3. The Revenue Accounts, which record the gross and net revenue.
4. The Expense Accounts, which represent all the indirect charges against the operators.

The Asset Accounts—The asset accounts fall into two general groups, the current assets and the permanent assets. The word "current" in its original sense means flow, and the current accounts are those which flow constantly, in much the same way as a river or a stream, increasing or decreasing in volume with time and season.

These accounts generally include the following items: Cash, notes receivable, accounts receivable, stocks and bonds, raw materials, work in process, supplies, prepaid insurance, prepaid taxes.

Permanent assets are those which do not regularly change their volume or character. They remain the same unless the business is expanded by the owner. These may be listed as follows: 1. Land; 2. Buildings; 3. Machinery; 4. Equipment; 5. Furniture and fixtures; 6. Organization expenses.

It will be noticed that in these two groups there is an item in the current assets for raw materials and another item in the fixed assets for land. The quarryman who owns his own land is faced with a curious problem. The raw material which goes to make up his product is deposited on the land itself, and yet it cannot be called a fixed asset because it is perishable and is being depleted month by month. On the other hand, there is a certain portion of this land which is permanent in its nature and whose value will never be destroyed or removed—that is, after a sand bank has been stripped of all its valuable deposits it may be leveled off and the land used for a factory site or any other purpose.

The book value of the sand property is divided into two parts, the value of the area covered by the property as real estate, and the value of the sand itself as raw material. For example, if the sand bank is worth $1000 an acre and the general real estate in the vicinity is worth $500 an acre, then the sand on one acre of land is worth $500. This division in the value of the sand bank is important because it permits accurate costing of the product and enables the operator to charge off depletion properly.

Four General Classes of Liabilities

Liabilities fall into four general classes: Current liabilities, permanent liabilities, reserves, and the capital accounts. The current liabilities are:

Current Liabilities: 1. Notes payable; 2. Accounts payable; 3. Accrued payroll; 4. Accrued cash; 5. Accrued insurance; 6. Accrued interest.

Permanent Liabilities: 1. Mortgages payable; 2. Outstanding bonds.

The Reserves are: 1. Reserves against depreciation; 2. Reserves against depletion; 3. Reserves against theft; 4. Reserves against bad debts.

Present worth—The Capital accounts are: 1. Capital stock; 2. Surplus; 3. Profit and loss to date.

The Revenue and Cost Accounts are: 1. Sales; 2. Cost of sales.

The Expense Accounts consist of selling and administrative expenses and the plant or general expenses. The administrative and building expenses are: 1. Executive salaries; 2. Clerical salaries; 3. Office expenses and supplies; 4. Association dues; 5. Charity; 6. Commission; 7. Advertising; 8. Telephone and telegraph; 9. Miscellaneous expenses.

The usual **burden** or **overhead expenses** are: 1. Salary of foreman; 2. Clerical expenses; 3. General labor; 4. Bonuses; 5. Machinery and equipment; 6. Electric current; 7. Coal; 8. Trucking and carting; 9. Gasoline; 10. Scows-repairs; 11. Tug-repairs; 12. Taxes; 13. Depreciation; 14. Depletion; 15. Stock insurance; 16. Maintenance of building; 17. Transmission; 18. Miscellaneous expenses.

The foregoing is given as a normal distribution of charges and expenses; it is by no means final or complete. A small plant could do with fewer accounts and a larger one would need more.

The Order Cost Theory

In order to make costing and general management a simple matter, it is necessary to divide production into definite periods of time and quantity. This is made easy by the fact that the scows or freight cars really determine the amount of work that can be done over a given period, and thus give the operator an opportunity to measure his results and to find whether he has been producing efficiently.

We will say that a sand bank turns out 1000 tons per day. Under proper conditions and with good labor output, 6000 tons per week is the normal output for this plant. Any quantity less than that number produced in one week indicates inefficient operation for one cause or another, and any quantity exceeding this number indicates a saving has been made.

The cost system carries this one step further and designates the output of a week by an order number, which states that a certain number of tons of sand or rock must be produced within a given period. This order is charged with all the sand labor and indirect expenses due to it as indicated by the predetermined rate for each unit of production; that is, for each kind of sand or other material produced.

This is called the order method of costing because the work is theoretically done through an order. This enables the operator to base his cost on the individual orders and to determine in each case whether loss or inefficiency is due to a particular class of work or to uncontrollable accidents for which no one class should be held to account.

The way to keep costs on each order and not to overload the bookkeeper with work is to separate the cost from the general books. The time reports, the material charges, and the expense charges are printed to standard size and when they are filled out they are filed behind their order numbers. All that is necessary to find the cost of one order is to refer to the file and collect all labor loading and expense charges against the one order number. By this method the expenses are also treated as orders and all labor and material on work that is charged to an expense account must be charged to the expense order number.

(To be continued)

Wealth in Phosphates

THE Geological Survey estimates the quantity of high-grade phosphate rock contained in the 2,500,000 acres of phosphate land now held by the government in Idaho, Wyoming and Utah at 267,000,000 tons, and the examination has not, it appears, yet been completed.

It is thought that when the full extent of the deposits has been explored they may prove to be the largest phosphate field in the world. Even low-grade phosphate rock has been proved to be available for use as fertilizer.

Storage and Novel Water System Features at This Phosphate Plant

American Agricultural Chemical Co., Pierce, Fla., Has Concrete Storage Bins of 45,000 Tons Capacity and a Water System Which Affords Continuous Use of the Same Water

THE American Agricultural Chemical Co. is one of the 12 phosphate companies operating in the pebble-phosphate district of Polk county, Florida. The total capital stock of these 12 companies is estimated at approximately $75,000,000 and the phosphate property owned and controlled by them is estimated at 125,000 acres. The combined output of these companies for 1922 was nearly 2,000,000 tons, valued at more than $10,000,000. Statisticians assert that the known deposits will last about 100 years at the present rate of production. Florida supplies more than 60 per cent of the phosphate used in the world and 90 per of this amount is mined in this single district.

The American Agricultural Chemical Co. is one of the largest of these operations, having a daily output of 2000 tons, and concrete storage bins for more than 45,000 tons of washed, graded and dried material. Buildings and equipment, including washing and drying units, power house, dwelling houses, railway and water-handling equipment owned and operated by this company represent an investment of several millions of dollars.

Storage bins at the American Agricultural Chemical Co.'s plant at Pierce, Fla. The total capacity is 45,000 tons and 40 cars may be loaded from them at a time

The Mining Operation

With the exception of two or three sand operations, phosphate is the only rock product mined by the hydraulic method in the United States, although this method is used for stripping overburden at various plants all over the country.

The application of the hydraulic method at this operation however, is unusual, inasmuch as the water-handling system is one which permits using the water over and over again and results in an economical production.

The sketch illustrates the method used at all of the pits operated by this company. It is only possible to employ this system at a pit near or adjoining a worked-out pit. The worked-out pit becomes a pool, originally furnished with water from a pumping unit centrally located with respect to all the pits, which range from five to eight in number and which are one, two or three miles apart.

Near the worked-out pit is mounted the pressure pump which supplies the nozzles, or hydraulic giants, through a 14-in. or larger line. At any point inside the new pit this line is split into two 8-in. lines which extend to within 30 or 40 ft. of the bank and which are fitted with 1¾-in. nozzles. Ditches, dug by the giants, carry the material knocked down by the water pressure to a sump hole.

Above the sump hole is mounted a 10 or 12-in. suction pump which pumps from the hole direct to the washing and screening plant. The length of this pump's suction

One of the hydraulic pools—a worked-out pit. The building at the left houses the pressure pump which furnishes the hydraulic giants in the pit in the background

The overflow from the washing plant is pumped into this settling pond and is used over again

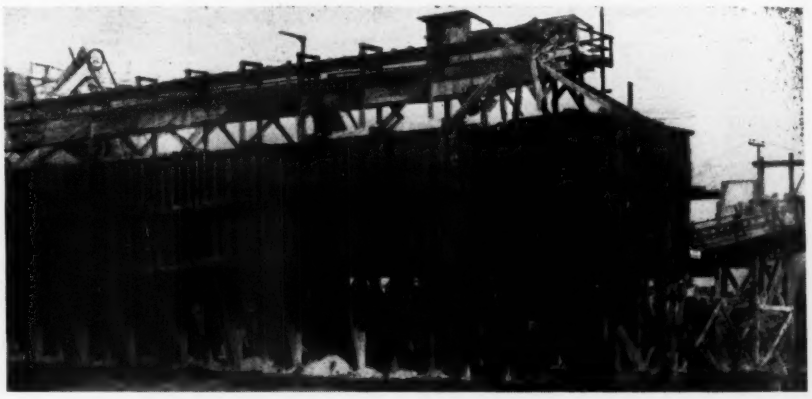
line varies from 20 to 50 ft., with a lift not greater than from 15 to 20 ft.

From the screening and washing plant the overflow is flumed to a second sump hole and there it is picked up by a 10 or 12-in. pump and moved to an artificial lake, or settling pond, covering several acres. At the opposite end of this pond are adjustable gates which permit any desired amount of water to overflow; this is taken care of by sluice boxes and returned to the mined-out pit.

In that way the same water is used continuously. As there is a certain amount of seepage and absorption, this loss is made up by a supply coming by ditch from a 1000-ft. artesian well. This well is supplied by a centrifugal pump with a 16-in. suction and 14-in. discharge, driven by a 200-hp. induction motor and delivering 6000 g.p.m. to a small reservoir. Ditches lead off from this reservoir to the various pits. It is necessary to run this unit only part of the time to make up the small amount of water lost at the pits.

Washing and Screening

At present the company is operating three washers and three pits, having an individual washer for each pit. Although of solid and heavy construction, these units are not elaborate as they must be moved whenever a pit is worked out. No concrete is used in building them, their construction being entirely of timber.



One of the washing units. It has a bin capacity of 1000 tons

These plants are not similar to either a stone or sand and gravel plant, although they are made up of equipment found at both these operations. The pipe line from the sump hole in the pit empties in a 4x40-ft. steel-lined sluiceway which is used primarily to allow the material to spread out so that it will more evenly distribute itself in the screens. The primary screen is 4 ft. in

This view, taken from the top of the storage bins, shows some of the company's buildings. In the foreground at the right is the machine shop; center, the commissary, and at the left, the supply house. In the background at the right is the company hotel.

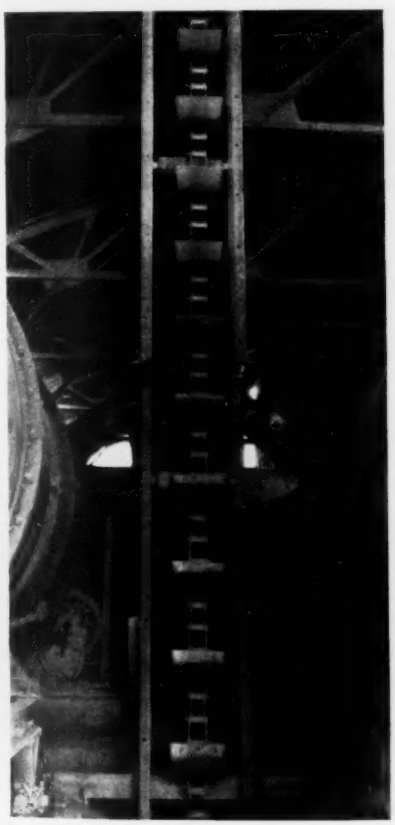
The material is received from the pit in this 4x40-ft. steel-lined flume which empties into a revolving screen

diameter, 12 ft. long, revolving, with a 1¼-in. perforations. In line with this screen and in tandem are two sets of log washers, each being stepped down to permit a gravity feed from one to the other. The product of these washers, together with that passing through the revolving screen, is discharged into the boot of a chain-bucket elevator of 30-ft. center, fitted with 8x16-in. buckets. This elevator empties into a box hopper mounted on top of the structure, from which it flows by gravity over an electric vibrating screen. As the material flows over this screen it is washed by a water supply from a series of six 1-in. perforated lines passing over the screen. This screen removes any small foreign matter that might have passed through the log washers. This installation is shown in one of the illustrations.

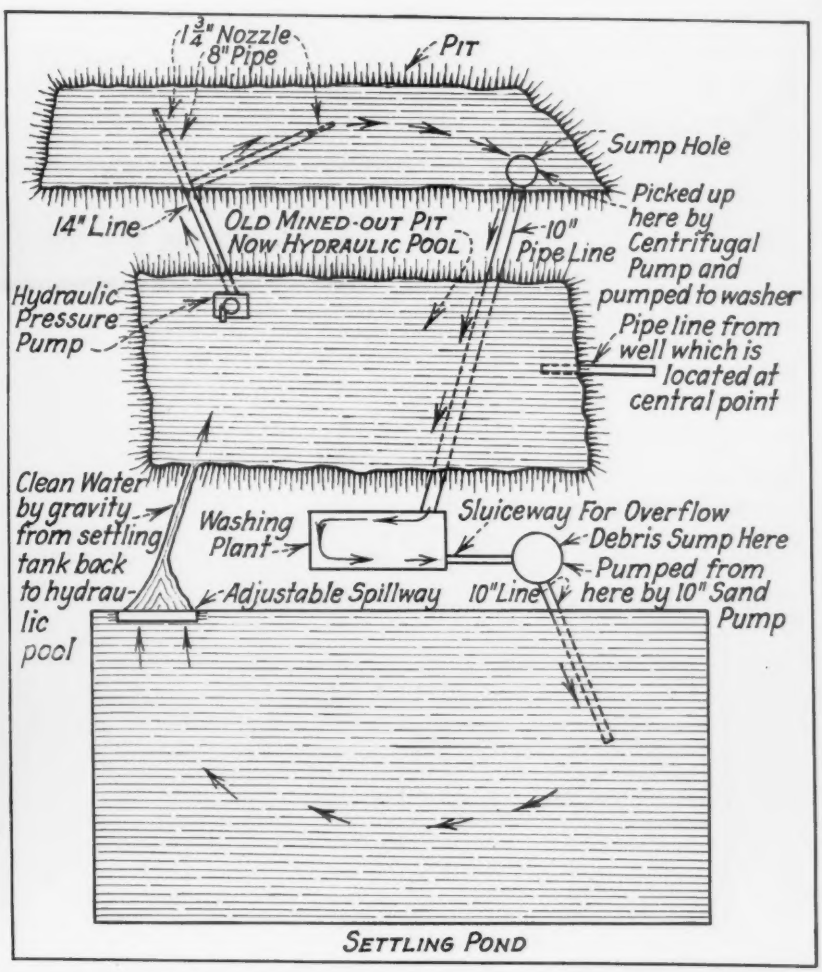
From the vibrating screen the product passes into the boot of a 16-in. by 30-ft. chain-bucket elevator which in turn discharges into a second elevator of the same size. This elevator empties in a small hopper which feeds two drag conveyors—moving in opposite directions. One conveyor fills up the bins on one end; the other, those on the opposite end. As the bin closest to the feed point of the conveyor fills up, the conveyor drags the material over the top of the filled bin, depositing it in the next, and so on. The total bin capacity is 1000 tons.

From these bins the washed phosphate is dropped into 30-ton, drop-bottom, standard-gage cars which are moved in trains of 20 cars each by 60-ton locomotives to the cen-

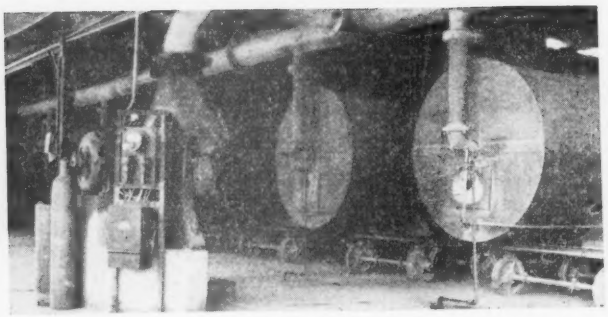
After being washed and screened in a rotary screen and log washer, the material is put over this electric vibrating screen



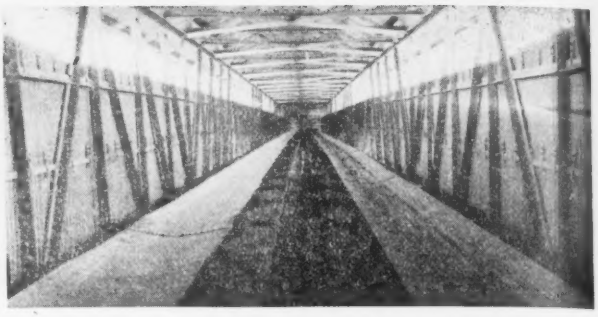
One of the elevators which deliver the material from the driers to the conveyors



Sketch showing general arrangement and layout of one of the pits



These 42-in. driers are fitted with oil burners and make 14 r.p.m.



The main conveyors from the drying plant to storage are 20 in. wide and are of 367-ft. centers

tral drying plant. Surplus material is hauled to an outside storage near the drying plant and dumped from a trestle. Reclamation is made by a Brownhoist locomotive crane equipped with a 2-yd. clamshell bucket.

The Drying Plant

Loaded cars from the pits or storage are brought up a slight incline at the drying plant and dumped from a tipple into four hoppers. Two cars can be dumped in each hopper at a time, or eight cars altogether. Two 16-in. belt conveyors of 25-ft. centers serve each hopper for the removal of the material and each empties into the boot of a 16-in. by 25-ft. chain-bucket elevator. This elevator in turn empties on a second belt conveyor which carries the material to a drier.

There are eight revolving driers, 48 in. in diameter and 26 ft. long, manufactured by J. S. Schofield & Sons, Macon, Ga. These driers make 14 r.p.m. and are equipped with Hammel oil-burning equipment, with the exception of the burners, which are of the company's own design. Air for atomization is furnished by two General Electric centrifugal blowers of 4200 cu. ft. capacity. A 14-in. line from the blowers extends over the driers and from this line 6-in. lines branch off to each drier. Mexican petroleum oil is used exclusively and is fed in through a 1-in. line. A ¾-in. steam line is provided at each burner for cleaning purposes.

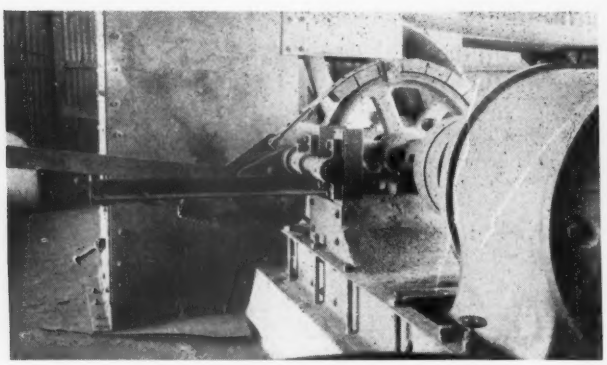
One of the shuttle conveyors which run the entire length of the storage

Four chain-bucket elevators, fitted with 6x12x7-in. buckets, take care of the discharge of the eight driers. The elevators vary in length in accordance with the 17 deg. incline of the twin belt conveyors on which they discharge.

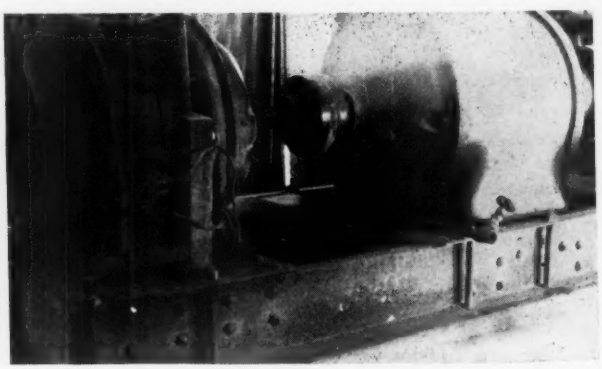
The dryed phosphate is emptied on these two main conveyors at a heat of approximately 225 deg. Fahr. The conveyors are 20 in. wide, of 367-ft. centers, and run for a distance of approximately 150 ft. at a pitch of 17 deg. and the remainder of their length at a 9-deg. incline. They are mounted on structural steel supports.

Storage Facilities

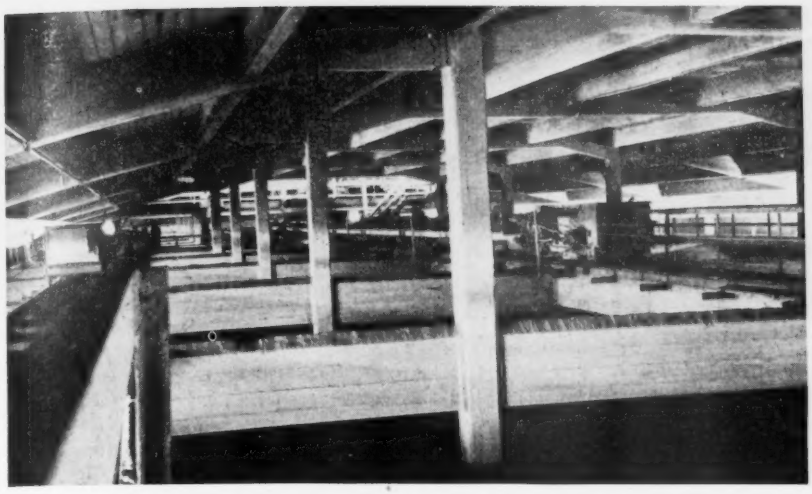
Within the concrete storage building at the discharge end of the main conveyors is a separate apartment for the head pulleys, motors, gear reducers, and emergency brakes. Each conveyor is driven by a 25-hp. motor through a 36.3 to 1 gear reducer. On the shaft between the gear reducer and the conveyor-belt pulley is mounted a 16-in. pulley with a 5-in. face which is provided with a patented friction brake—used in cases



Each conveyor is fitted with one of these friction emergency brakes



The main conveyors are individually driven by 25-hp. motors through a 36.3 to 1 gear reducer



Interior view of the storage showing shuttle conveyors on each side. The building is 380 ft. long

One of the four tracks running under the bins. Each track can accommodate 10 cars

of emergency only. Each conveyor is fitted with one so that should anything break, or if for any reason a conveyor should start running backward, a positive stop is assured. A man is in continual attendance at this point.

The main conveyors empty into reversible chutes which feed two 18-in. by 26-ft. cross shuttle conveyors. These conveyors extend the full width of the building and can be discharged into either of two shuttle conveyors running the length of the storage.

There are four tracks under the bins with chutes every 10 ft. for center or side loading. As the total length of the bins is 340 ft., 10 cars at a time can be accommodated on each track or 40 cars at a time from the entire storage.

Other Departments

This operation is of such size and has equipment in such quantity that every provision for taking care of repairs of any nature is necessary, as the plant is far removed from a town or city having machine shops. The company's repair shops—both mechanical and electrical—as well as machine and carpenter shops, are modern and complete in every respect. Duplicate parts from nuts to flywheels are kept on hand for every piece of equipment on the job. One of the illustrations shows the outside storage of the heavier extra parts.

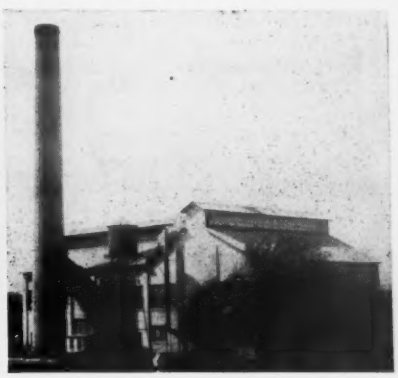
As at cement operations, a laboratory is maintained so that a check is kept on the grading of the phosphate at all times. Owing to the variations in grade, it is necessary that the different classes be stored separately.

Owing to the many buildings which the company owns—including its dwelling houses—a fire department is maintained which is complete with all modern equipment, including a chemical motor truck.

The Living Accommodations

As the operation is some distance from the nearest town, the company has built up two settlements—one for the white and one for the negro employes—and the entire community makes up the village of Pierce, Polk county. Every provision possible for the welfare, comfort, and happiness of the employes has been made. The housing problem as treated by this company was presented in Rock Products, April 21, 1923, pages 30, 31, under the caption "Keeping Men Satisfied." Also, on pages 25, 26, in the April 7, 1923 issue, was published—under the caption "'Safety First' On a Large Scale"—how the company creates enthusiasm among its employes for "safety

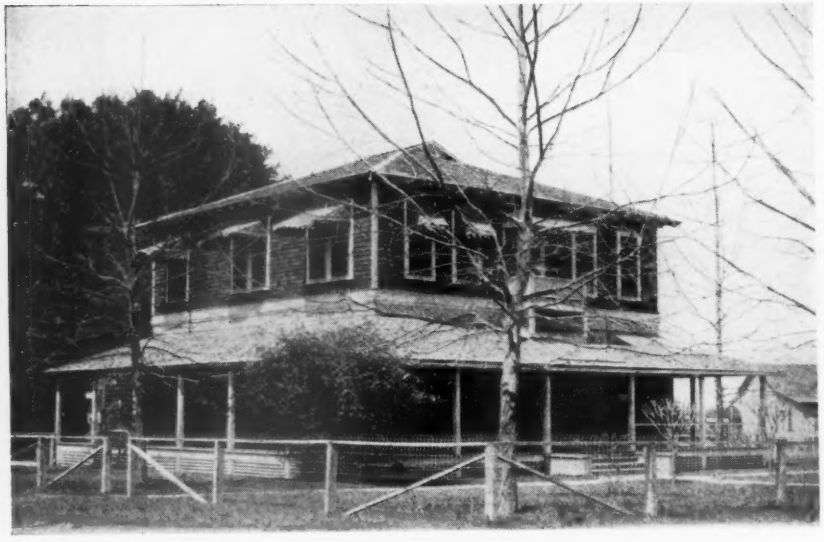
Where the heavier extra parts are stored. Note the barbed-wire enclosure



The power house and pumping station

These shuttles, as well as all other conveying equipment in the storage plant proper, including the main conveyors from the drying plant, are manufactured by the Portable Machinery Co., Passaic, N. J., and are electrically operated, chain driven.

The storage building is made up of three rows of concrete silo-type bins. The two outer rows have 12 silos each and the center row have three. The remaining space between the outer rows is used as one bin so that an even larger storage space is available than if silos were built in. As each bin has a capacity of 1000 tons, the total storage capacity is 45,000 tons.



The office. It's just as home-like and cozy as it looks

first" in all its departments. This work is commendable and is one which has greatly increased the efficiency of the whole organization.

The company's offices are in a separate building, from which the entire operation covering the production and shipment of the material is directed. Burdett Loomis, Jr. is manager and G. M. Whetstone is general superintendent.

Some Neglected Factors in the Care of Equipment

By Clarence E. Bement

Vice-President and General Manager, Novo Engine Co., Lansing, Mich.

IN recent years much publicity has been given the subject of "Service"—meaning that branch of the manufacturer's business treating of proper operation and maintenance of equipment in the field. This extends all the way from such small courtesies as placing a man at the owner's disposal to instruct his operator, to replacing the whole unit if it proves to be unsatisfactory. All manufacturers are alert to the importance of rendering such service in the most efficient and acceptable manner.

Strange to say, the importance of this service is more fully appreciated by the manufacturer than the owner. From the standpoint of a manufacturer of equipment used in the construction industry we find a surprising condition of indifference with respect to the proper operation and maintenance of equipment sold by us, notwithstanding the fact that equipment out of commission becomes a most serious factor of annoyance and expense to the owner. The fact that the purchase of a piece of machinery frequently represents an investment of much money, seems to be lost sight of, although its efficient service may mean to the owner the difference between profit and loss on a job.

Many constructors do not have a mechanic on the job, but entrust the care and adjustment of expensive machinery to untrained men. The result is that bearings and gears break because concrete is allowed to collect day after day; grease cups are broken off and the hole becomes clogged with dirt. Until the final crash comes the power consumed in overcoming the friction in such plants constitutes a large percentage of the total consumption of power—perhaps 50 per cent or more. On top of this is the expense due to the delay while waiting for the arrival of the repair parts that have been ordered.

With few exceptions constructors do not appreciate how anxious the manufacturer is to put his service departments on the most efficient basis or how much depends upon the contractor's own co-operation. This is not fault-finding criticism. The constructor has many problems to solve, and as long as a machine will run at all its proper care seems one of lesser importance.

Lubrication is perhaps the oldest and at the same time one of the most important of all maintenance problems. If a statement representing the expense chargeable to improper lubrication or lack of lubrication could be placed before the individual owners of machinery used in the construction industry, and immediate and far-reaching reform in this phase of the maintenance problem would result.

In the matter of repair parts, a little foresight on the part of the owner or operator will in most cases eliminate delay and the expense incident thereto. The observance of a few simple rules applicable in all cases would result in a great advantage to both the manufacturer and owner. Care should be exercised in giving complete name, address and point to which parts should be shipped. Complete part number and name of part should be specified, as well as serial number of machine and size, if so designated. If in doubt as to part number and description send in old part properly tagged for identification.

Constructors can save themselves much money by having their equipment thoroughly examined during idle periods, either by their own mechanics or one representing the manufacturer. Worn parts can then be replaced, bearings rebabbitted and everything put in perfect working order. After this has been done the machines should be repainted, all exposed iron and steel surfaces greased, and then placed under cover.

Machinery given such care and attention will long outlive machinery which receives no attention, until it breaks down. The owner will be repaid in the more efficient and longer service to be had from the machine and this benefit is reflected to the manufacturer in the more cordial feeling toward the equipment sold by him.—*The Engineering News Record.*

South Dakota State Cement Plant to Have Rival

THE Globe Portland Cement Co. has purchased 1120 acres of property at Rapid City, S. D., within a mile of the site of the state-owned cement plant now under construction. A local newspaper quotes the chief engineer of the new company as follows:

"H. H. Hindshaw, chief engineer of the Globe Portland Cement Co., who conducted the negotiations for the purchase of the 1120 acres of land for his company, has been doing some figuring, and he finds that 600,000 people live within the shipping territory to which Rapid City firms and plants can ship cement on an equal basis with cement manufacturing plants outside South Dakota.

"According to him, lower production costs, because of natural resources in the Rapid City field, will enable Rapid City plants to compete in a large zone, within which reside approximately 2,000,000 people.

"In other words, within the legitimate trade territory of Rapid City the annual sale of cement exceeds 2,000,000 bbl., or the equivalent of full-time production from three plants the size of the state-owned plant and the Globe Portland Cement Co. plant, each with an output of 2000 bbl. daily."

Transportation Systems at Lime-Plant Quarries

Operators Are Requested to Discuss Their Experiences with the Bureau—Such an Interchange Will Benefit the Entire Industry

By Oliver Bowles
Mineral Technologist, U. S. Bureau of Mines

THIS paper is the fourth of the current series issued by the Bureau of Mines on lime-plant problems. It is hoped that the information presented in these reports will develop sufficient interest among lime-plant operators to prompt them to discuss with the bureau their own experiences, for it is believed that by such an interchange, conclusions will be reached that will be of practical benefit to the entire industry. Much valuable information has been obtained from replies to the papers already issued, but a more general response is greatly desired. It is hoped that many operators will contribute additions to the information on transportation systems now at hand by answering the questions on the final page.

Transportation Equipment

Transportation involves the motive power and equipment required to convey the rock from the loading place at the quarry face to the kilns where it is burned into lime. Where crushing and screening plants are operated in connection with the quarry a separate transportation system is required to convey the rock from screens to kilns and to dispose of the fine materials. Transportation equipment may be divided into three classes: trackage, cars, and haulage systems. Trackage may for convenience be subdivided into horizontal or slightly inclined tracks and steeply inclined tracks that require cable haulage.

Trackage Within the Quarry

The arrangement of tracks for quarry cars depends upon the loading method and the size and shape of the quarry opening. For hand loading it is desirable, in order to maintain a maximum output, to provide many working places each with independent trackage from the main line. At some plants the tracks converge like the spokes of a wheel from the quarry face to the point where the rock leaves the quarry. Thus cars may be placed at many points along the face, and this layout provides independent movement for cars loaded at each working place. For a long quarry face a main line may be placed parallel with the face with branches running from it to the face at intervals. At one quarry in Pennsylvania two such main lines are provided, one for empties and one for loaded cars, the latter being hauled away in trains of 15 or 20 cars by locomotives.

For steam-shovel loading two different systems are followed, depending on the width of the working face. Where the face is wide enough to permit necessary movement of cars, the car track should preferably be placed parallel with the face so that cars may be moved along and filled in succession until a train of loaded cars is obtained. This is the system followed in practically all large quarries.

It is not always possible, however, to provide a wide face. A thin bed of limestone may stand at a steep angle and may be worked from the end, or other conditions may be present that render it necessary or advisable to operate a steam shovel on a narrow face. Under such conditions the tracks should run directly toward the face, and preferably there should be two tracks within reach of the shovel dipper. One, two, or if the shovel arm has a long reach, possibly three cars may be placed on one track and loaded. In the meantime, empties may be placed on the parallel track. As the empties may be filled while the loaded cars are being taken away, fairly continuous shovel operation is assured. If, on the other hand, a single track only is provided, the shovel must remain in idleness during the period while the loaded cars are being removed and the empties returned.

It is important that gravity should be utilized as fully as possible for car movement within the quarry. This means of transportation should be kept prominently in mind in the general layout of tracks so that proper gradients may be secured. In general it is advisable to maintain a grade which will permit gravity movement of loaded cars from the face to the point of egress from the quarry, then horses, mules, or some form of mechanical haulage may be employed to return the empties to the face.

In large quarries where loaded cars are hauled in trains by locomotive, a suitable gradient of the tracks to utilize gravity is of less consequence than where cars are handled by mules, horses or in part at least by quarry laborers. However, it is possible to arrange tracks so as to utilize gravity for all car movement within the quarry.

At one cement-plant quarry in New Jersey the empty car is switched off at a point considerably above the foot of the incline, conducted by gravity to the steam shovel where the wheels are blocked until the car is loaded, after which a continued down grade permits the force of gravity to conduct it to the foot of the incline. Thus transportation within the quarry is almost automatic. Conditions are not always favorable for such track arrangement, but in general the force of gravity could be utilized to a much greater extent than present quarry practice would seem to indicate.

At some point in the quarry there is usually a change in the method of haulage. In pit quarries this point is at the foot of the incline up which the cars are hauled to the quarry bank. At shelf quarries it is the place where the cars are assembled for removal in trains. Where shelf quarries are located at elevations above the lime kilns, the change in the method of transportation may take place at the top of an inclined railway. Whatever the change in method may be, it is important that adequate quarry trackage be maintained.

At this point empty cars are exchanged for loaded cars, and a system of switches and sidings should be provided which will permit this exchange with the greatest facility. From the branch tracks within the quarry, a double track may lead to the foot of the incline or other position where a change in the method of haulage is accomplished. One of the tracks is used for loaded cars and the empties are switched over to the second track. Where the incline is situated some distance from loading places a single track may be used, but in such a case a siding must be provided to accommodate the empty cars. Where several classes of materials are handled it is convenient to have several sidings.

At one Virginia quarry sidings are provided for rock cars, dirt cars, and empties. Where steam-shovel loading is followed in wide quarries and the cars are removed in trains, the trackage plan is simple. The train of empties is brought in on a track

beside the shovel, the cars loaded in succession, and the train of loaded cars removed. Where the grade will permit, the entire train may be taken directly to the kilns. If an incline is used, the train of loaded cars is left at the incline and a train of empties secured from an adjoining track or switch.

Where loaded cars are removed in trains from quarries in which hand-loading methods are pursued, the trackage may be more complex. Tracks may be so arranged that loaded cars from the various spurs leading to the face may be assembled in a train; provision must also be made for so disposing of a train of empties that they may be readily distributed to the spurs.

Inclined Tracks

Tracks so steeply inclined as to require a cable haulage system are common at most lime plants. They may be used for the removal of rock from pit quarries, for the elevation of rock to the kilns, or, less commonly, for letting rock down from high elevations to lower levels. The incline may consist of a single track or of two or more tracks. Where it is desirable to keep the crusher almost continuously supplied with rock, double tracks are often provided and carloads dumped into the crusher alternately from opposite sides. For short inclines each car is usually handled independently, but on long inclines a car may be attached to each end of a long cable, the empty being returned while the loaded car is elevated. By this means the weight of the empty car assists in elevating the loaded one, and time is also saved. Such a system may have double tracks the entire length of the incline, or a single track below the center switch and a double or three-rail track above it.

Quality and Condition of Tracks

The gage of quarry tracks varies generally from 24 to 42 in., though standard railroad gage, 56½ in., is occasionally used; 24-in. gage is most common where cars are loaded by hand. Tracks should consist of fairly heavy rail steel. A light rail is inexpensive and is convenient to handle, but it requires close tie supports and is easily bent. The unevenness resulting from such bends causes many car derailments.

It is desirable that a good roadbed be maintained. An uneven track not only strains cars and wastes power, but results in frequent derailment with consequent breakage to equipment and great loss of time. The time thus lost may not only affect those engaged in loading and transporting, but may seriously delay following operations. Grades should be modified to suit the method of haulage. It is not wise to attempt locomotive haulage on very steep grades as too much time and power are consumed. When grades become unduly steep it is better to reduce them to low inclines where locomotive, horse or mule haulage are used, and to employ cable haulage on steep inclines in order to obtain the necessary elevation.

There is great room for improvement in trackage on inclines. Through unevenness of rail joints, improper spacing of ties, lack of uniformity in roadbed or poor switches, cars may jump the tracks; this results in great loss of time and damage to equipment. At one quarry recently visited by the writer, four times in a space of half an hour quarry cars jumped the track near the top of the incline. Part of the trouble may have been due to improper control by the hoist engineer, but poor trackage accounts for many mishaps of this character. At one Pennsylvania lime plant the rails on the upper part of the incline consist of 5x5-in. angle steel, and the 5-in. vertical web effectively prevents derailment.

The curvature of roadbeds is also an important feature of inclines, particularly with regard to safety. Lateral curvature is undesirable owing to the difficulty of controlling cables and the danger that results from the lateral movement of the cable as the car passes around a curve. Another undesirable condition is an upward or convex curvature of the roadbed which renders the top of the incline invisible from points near the bottom. Such a condition is dangerous, for a workman at the foot of the incline cannot observe the approach of a descending empty car until it travels possibly nearly half the total descent.

The Quarry Cars

Quarry cars are of many different types and sizes. For hand loading, 2 to 2½-ton cars seem to be the most popular. For steam-shovel loading larger cars are preferred. Side-dump cars are the most common, though end dump cars are used at some quarries. Both wooden and sheet metal top cars are used, and each type has its advocates. The metal top is in general more durable than wood, but is more difficult to repair. Where steam shovels are used metal tops are bent with the heavy rock masses and it is difficult to straighten them. On this account some operators prefer the wooden tops that may be easily and quickly repaired in the quarry shops. Some quarry cars for heavy steam-shovel work are made of steel plate, an oak cushion over the plate, and a light steel cover plate protecting the wood. The top plate allows a smooth sliding surface for discharging the load, while the wooden cushion protects the main body plate. The light plate and wood are bolted to the body plate, and thus may be easily replaced when worn out.

Cars for steam-shovel loading should be strong and durable, for they are of necessity subjected to much rougher usage than those loaded by hand. Cars for hand loading should be low to save the loader the laborious task of lifting the rock unnecessarily high above the ground.

There is need of better standardization of quarry cars. The demands are so variable that most car manufacturers cannot keep cars in stock. If quarry operators would establish a few standard types and sizes that could be kept in stock, orders could be more quickly filled; also through the advantage of constructing cars with more completely standardized parts, the cost could probably be reduced.

It is important that an adequate supply of cars be provided. If a small number of cars is available any unusual delay in disposing of loaded cars may keep quarry loaders or loading equipment in idleness, and, on the other hand, delay in loading may soon retard following operations if there is no reserve supply of loaded cars.

Haulage Within the Quarry

Gravity is the most economical means of transportation if conditions are favorable. The utilization of gravity depends chiefly on track arrangement and has already been discussed in that connection. In large quarries electric, gasoline or steam locomotives are commonly used. Steam locomotives or "dinkeys" may haul 5 to 15 or 20 cars at one time; those driven by gasoline or electricity may be smaller types that haul 1 to 3 cars only, though some of the later gasoline locomotives will haul 10 to 15 cars. Electrically driven locomotives are uncommon in open quarries. Locomotive haulage is usually employed in quarries where steam shovels are used, horses or mules being generally employed where the rock is hand loaded. An economical method is to maintain a gentle downgrade from the face of the incline which permits loaded cars to be conveyed by gravity. The empties may be returned by horses or mules.

Haulage on Inclines

A cable and drum is the most common haulage equipment employed on inclines. Usually at lime-plant quarries each car is handled as a single unit independent of other cars, but in many classes of rough-stone operation the empty descends on one end of the cable while the loaded car ascends. Commonly two or more tracks are used, each with its own haulage system.

The so-called "groundhog" or "barney car" is used in connection with a cable hoist on some inclines. A heavy buffer, mounted on four wheels and attached to the cable, operates on a narrow-gage track situated between the rails of the car track. At some distance from the foot of the incline the narrow-gage track runs into a depression below the car track level. When the cable is out the buffer rests in this depression. The loaded cars pass along the track over this excavation. As the cable winds on the drum the buffer comes up behind the car and pushes it up the incline. Usually one car only is taken up at a time. One advantage of this method is that the inconvenience and danger of attaching the cable to loaded cars and unhooking it from empties are eliminated. Also, when the empty car is returned to the pit there is no need of stopping the car, or even of slackening speed at the foot of the incline, and the uninterrupted momentum may thus be sufficient to carry it to any part of the quarry.

Skill and care are important requisites of an efficient hoisting engineer. In many instances cars are wrecked, operations delayed and accidents caused by running cars at dangerous rates on inclines, by stopping or starting them too suddenly, or by failing to check the speed or bring cars to a stop at the proper points.

Haulage equipment on inclines should be subjected to frequent, careful scrutiny and any weaknesses corrected without delay, for the failure of equipment on an incline is likely to have more disastrous results than the same failure on level tracks.

There is a notable dearth of information on haulage costs. Many operators do not segregate such costs from other items of quarry expense, therefore the bureau has no basis for comparison of the actual cost by different methods. If any operators who have figures for transportation costs, including motive power, labor, track, and car repairs, would submit them to the bureau, such data would be of great assistance in determining the relative efficiency of different systems.

Summary

Answers to the following questions would assist the bureau greatly in its study of transportation problems:

1. Do you utilize gravity for transportation in or about your quarry? If so please describe the system briefly.
2. Do you consider it advisable to establish standard types and sizes of quarry cars?
3. Do you prefer metal-top or wooden-top cars, and why?
4. Do you prefer horses or mules to steam, gasoline or electric locomotives? Give reasons.
5. Please describe any new features you have learned regarding track arrangement or handling of cars.
6. Will you please submit any figures you have on the cost of transporting rock?

Nature, Preparation and Use of Pulverized Coal*

IV—Fineness to Which Coal Should Be Ground. The Effect of Moisture and of Ash in Coal

By Richard K. Meade
Chemical and Industrial Engineer, Baltimore, Md.

THE first step in the burning of pulverized coal is to subdivide the fuel into as fine particles as is possible so that when mixed with the air it will form with the latter a mixture which approaches the gaseous condition. This statement is comparative only, because, no matter how fine we grind coal, the latter will still retain its solid structure. On the other hand, the finer we do grind it, the more nearly this conditions results.

How Fineness Is Measured

The fineness of pulverized coal is measured by standard testing screens or sieves. These screens are designated by the number of openings or meshes there are to a linear inch. Thus a screen having 100 openings to the linear inch is known as the 100-mesh screen (or sieve), sometimes as the No. 100 test screen (or sieve). Similarly, a screen with 200 openings to the inch is called the 200-mesh screen. The 100-mesh screen has 10,000 openings and the 200-mesh has 40,000 to the square inch, etc.

The actual size of the opening is determined by the size of the wire of which the cloth of the screen is made. This size wire is fixed by certain prescribed standards. In the case of the 100-mesh screen, a wire of 0.0045 in. diameter is used. The size of particle which will pass through the openings of the 100-mesh sieve must be something less than 0.0065 in. in two dimensions. The fineness of coal is expressed as the percentage of this which will pass a given sieve. Thus when we speak of coal as being ground to a fineness of 95 per cent through a 100-mesh screen (or 95 per cent 100-mesh) we mean that 95 per cent of it will pass through this screen and 5 per cent will remain on it. Or, still more exactly, 95 per cent of its particles are less than 0.0065 in. in two diameters and 5 per cent are larger than this, etc.

In practice, the fineness to which coal can be conveniently ground is quite thoroughly established, and this fineness seems to be sufficient for the ordinary furnace. In the cement industry, coal is rarely ground to a fineness much greater than 80 per cent passing the 200-mesh screen. In the metallurgical industry, there seems to be a tendency to grind somewhat finer than this and a fineness of 85 to 95 per cent passing the 200-mesh sieve is often employed.

It is possible under some conditions to burn very coarsely ground coal. Material as coarsely ground as 60 mesh can be burned in a hot furnace. The deflagration is not as rapid, however, as with the finely ground material.

The statement is often made that fine grinding increases the efficiency of the furnace or boiler to which the coal is applied. This statement is perhaps too general. The finer the coal, the more rapid is the combustion. Coarse coal also requires an air current of high velocity to keep it in suspension. Coarsely ground coal, therefore, is not well adapted to burning in short chambers and is only permissible where the furnace is long and ample time is given for its combustion.

In burning pulverized coal it must be remembered that the coal must be completely consumed in the time it takes the particles to travel through the furnace or else unburned coal will enter the stack, etc., and the fineness must usually be regulated to give this result.

In heating the rotary cement kiln and other furnaces of this character, if the pulverized coal particles fall to the bottom of the rotating cylinder before they are completely burned, no loss of efficiency occurs, because combustion ultimately takes place in the bottom of the furnace.

In the case of a boiler, however, if the coal falls to the bottom of the furnace, it is apt to coke and, owing to its position away from the air currents, it is not consumed and there is a loss of fuel. If it is blown among the boiler tubes, the temperature of the coal is reduced below the ignition point and combustion does not take place and the unburned coal is blown out of the stack and so lost. The finer the coal is ground, the less ash will settle on the charge, other conditions being equal, because the ash particles, being lighter, are kept in suspension longer and hence are more likely to pass out of the furnace.

The following degrees of fineness seem to be generally recognized as sufficient for ordinary bituminous coal. Certain opera-

tors may deviate from these requirements, due to personal opinions or lack of proper equipment, but certainly if the coal is ground within the limits specified good results will be obtained in most instances:

For heating rotary lime kilns, cement kilns, etc., 88 to 92 per cent passing the 100-mesh screen.

For heating boilers, 85 to 95 per cent passing the 100-mesh screen.

For metallurgical furnaces, 90 to 95 per cent passing the 100-mesh screen.

Fineness Dependent on Nature of the Coal

Anthracite coals are much harder to ignite than bituminous coals and for this reason they should be more finely ground. This applies also to coals high in ash and other impurities. In deciding on the fineness to which coal should be ground, therefore, consideration must be given to the type of furnace to be employed, kind of fuel to be used, etc., and whether a long or short flame is required, the nature of the material which is to be treated, etc.

Ordinarily it is believed that the most suitable coals for burning in the pulverized condition are those high in volatile matter, such as bituminous coal and lignite. This supposition is based on the fact that such coals ignite more readily than do the low volatile coals. This belief is no doubt due to some extent to the fact that coals rich in volatile matter (the so-called soft coals) are much more easily pulverized than are the anthracite coals, the latter being difficult to pulverize.

It also happens that up until the time of the World War, slack coal or "screenings" could be obtained more cheaply than could run-of-mine and lump coal. This slack is usually high in volatile matter, and possibly for this reason was considered most desirable. As a matter of fact, the choice was due to the low price at which this fuel could be obtained and the ease with which it could be pulverized.

It is quite probable that for many purposes high volatile coal would be preferred, other things being equal, because the rapidity with which it ignites would seem to make fine grinding less necessary; its soft structure also makes pulverizing comparatively easy. The temperature of the flame obtained from powdered coal, however, is so high, ranging as it does from 2500 to 4000 deg. Fahr., that practically all grades of coal can be burned under suitable conditions. Given a number of coals to select from, the question would be one of economy—that is to say, the cost of the coal delivered, the expense of its preparation, and its thermal value rather than its chemical composition.

Effect of Moisture in Coal

Moisture in coal is objectionable for a number of reasons. It increases the difficulty with which the fuel can be pulverized and consequently adds to the cost of the operation. No matter whether the coal is to be dried before pulverizing or whether some type of pulverizer is used which will admit of the employment of coal as received from the mine, the water represented by this moisture must be evaporated, and fuel is required for this.

Where the coal is to be pulverized and stored and then blown into the furnace, it is necessary to dry the coal. Certain types of pulverizers will be mentioned later on ("Aero" Pulverizer and the "Pulviburner"), however, which can handle coal containing a considerable percentage (say, 10 per cent) of moisture. Our own experience with even these pulverizers, however, has been that with coals high in moisture (above 10 per cent), the operation of the pulverizer is considerably facilitated by first drying the coal. We have even found some cases in which it was impossible to satisfactorily pulverize and burn the wet coal with these, so that, generally speaking, where coal contains more than 10 per cent moisture it should be dried in any event, even with types of pulverizers which pulverize and deliver the coal to the furnace in one operation.

Dried pulverized coal will absorb some moisture on exposure to the air. Fig. 6 (shown in Rock Products for June 30, 1923) gives the results of an experiment made by Charles R. McCabe of the Lima Locomotive Corp. to determine the amount of this. His experiment indicates that dry pulverized bituminous coal absorbs about 0.01 per cent of moisture per minute in ordinary indoor atmosphere for about three-quarters of an hour when the absorption becomes slower. In practice, however, the amount of moisture absorbed is not sufficient to cause any difficulty or inconvenience in burning.

Effect of Ash

Ash is not objectionable for many uses except as it takes away from the thermal value of the coal. Very high ash coals can be successfully burned and no attention need be paid to whether the ash clinkers badly, etc., as this feature will cause no discomfort with pulverized coal. Where pulverized coal is to be used for burning lime, it is advisable to select a white ash coal, or at least the coal whose ash gives least color to the product. In cases where the ash enters the product and will reduce the purity of the latter, low ash coal is usually very desirable. In portland cement burning, the ash need not be considered, as this is so similar to clay in chemical composition that it enters and combines with the cement mixture and forms cement. With lime burning, on the other hand, the ash is objectionable because it enters the product and reduces the purity of the latter.

In this connection, some experiments made by the writer several years ago are interesting. In a rotary cement kiln 6 ft. in diameter and 60 ft. long it was found that only half the coal-ash fell on the charge; the other half was carried into the chimney by the draft. The ash of pulverized coal is very light. The particles, of course, occupy practically the same volume as the coal particles, and are only from 10 to 20 per cent of the weight of the latter, consequently they are carried off by the strong draft which exists in most furnaces.

With lime, the proportion of ash settling on the former is even less than with cement, as lime is the less "sticky" of the two. Experiments here indicate that when pulverized coal is used about 40 per cent of the ash of the fuel enters the lime. Assuming, therefore, that 450 lb. of coal are required to burn a ton of lime and that the ash amounts to 10 per cent of the weight of the coal, one ton of lime would contain 18 lb. of ash, or about 0.9 per cent. Below are two analyses showing lime burned with pulverized coal containing 11 per cent ash and what the same lime would be burned with producer gas:

COMPARISON OF LIME BURNED WITH PRODUCER GAS AND PULVERIZED COAL

	Analysis of lime burned with Pulverized Coal Per cent	Producer Gas Per cent
Silica	2.44	2.10
Iron oxide and alumina	1.15	0.80
Lime	94.33	95.00
Magnesia	1.22	1.24
Loss on ignition	.86	0.86

A larger amount of ash will be retained by lime in which there is a lot of fine material, such as where the fine limestone dust has not been screened out, than will remain where the dust is screened from the coarse stone. The dust seems to catch and hold the ash rather than to allow it to be carried away by the draft of the kiln.

Where pulverized coal high in ash is used to heat metallurgical furnaces, the ash-dust will settle to some extent on the charge, but never enough to cause appreciable insulating or blanketing of the latter from the heat.

Where regenerative furnaces are used to heat the air for combustion, this ash, of course, may collect in the checkerwork. Where pulverized fuel is used, therefore, the regenerators should be designed with large ash-settling chambers and instead of the checkerwork, baffle walls placed close together should be used and ample facilities provided in the way of openings so that the walls, etc., can be blown off.

Those who have boilers or other heat regenerative apparatus after their furnaces and who are contemplating installing pulverized fuel, will do well to study some of the later waste-heat boiler installations in the cement industry. Here ample provision is always made for not only cleaning off the boiler tubes but also for removing the ashes from the flues and housing. Of course here the ash constitutes only a part of the dust to be taken care of, but the methods employed are efficient

(To be continued)

The Gypsum Industry From a Quality Man's Viewpoint

III—Fuel Consumption by the Rotary and Kettle Processes Compared—Quality of Product Compared

IN the second installment of this series (see ROCK PRODUCTS for June 30, 1923) the statement was made that the Cummer or rotary process of calcination has proven more economical than the kettle process from the standpoint of fuel consumption. At a modern plant where both processes are employed a very accurate test was made extending over a period of several weeks that gives us reliable figures showing the amount of fuel consumed in calcining by both processes.

This test showed that it required comparatively 82.5 lb. of coal to calcine a ton of gypsum by the rotary method, 95 lb. to calcine a ton of first-settle plaster, and 115 lb. to calcine a ton of second-settle plaster.

While the actual comparative costs of manufacturing calcined gypsum are not available at present, it is known that the labor cost of operating a rotary calciner is at least 40 per cent less, and that this is the cheaper method from practically every angle where quantity production is desired.

Comparative Physical Properties of Gypsum Calcined by Each Method

In the accompanying table are given results comparing the physical properties of the products calcined by each method. Comparisons are made of setting time, water-absorbing property to give a normal consistency, dry bulk, wet bulk or spreading capacity (without sand), tensile strength, and compressive strength.

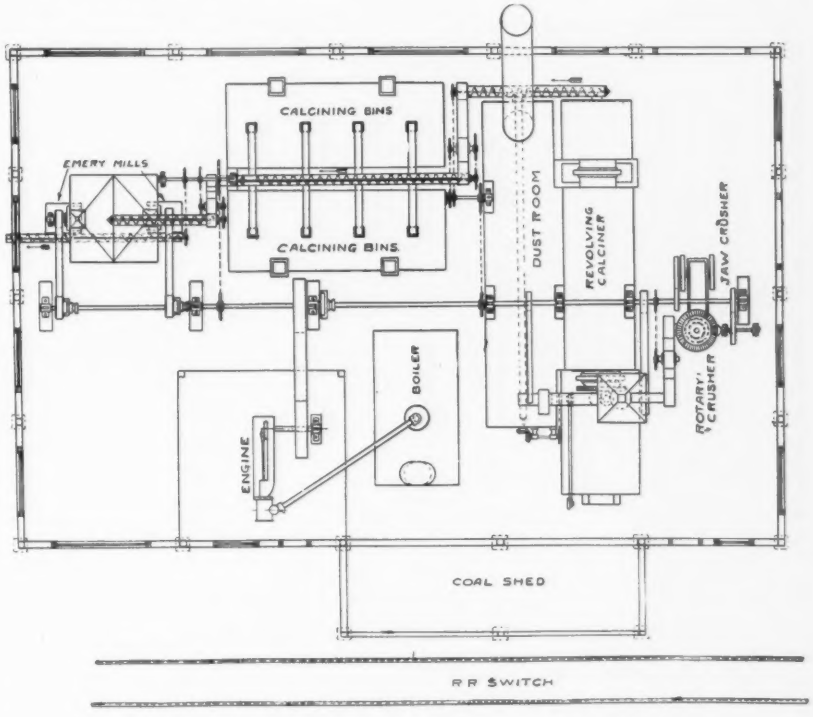
The setting time was determined by a Gillmore No. 1 needle. The consistency of each sample was determined by an experienced laboratory assistant and checked as closely as possible by the "slump" method.

The dry bulk tests were made in the following manner: A 6-in., 20-mesh testing sieve was placed over a 10-mesh sieve and the two sieves held by means of a horizontal wire support exactly 10 in. above a 400 c.c. receptacle. The dry sample was shaken by hand so that it would fall into the 400 c.c. receptacle below. When the receptacle was filled and carefully struck off with the edge of a rule, the contents was weighed. From an average of four tests made of each sample in this manner was calculated the volume, in terms of cubic centimeters, that 100 g. of the material would occupy.

The wet bulk tests were made by casting the mixtures in a cylindrical mold of small diameter and measuring the length and cubical volume of the cylindrical casts after they had set sufficiently hard to take from the mold. Before being poured it is understood that all of the mixtures were made as closely as could be determined to the same consistency, and it was noted that the volume of each cast bore a direct ratio to the percentage of mixing water required to render the sample to a standard consistency. To avoid the difficulties of working and casting dense mixtures a standard degree of consistency was adopted in all of these tests which was comparatively lean. The tests for compressive strength were made with cylindrical samples 1 in. in diameter and 2 in. high.

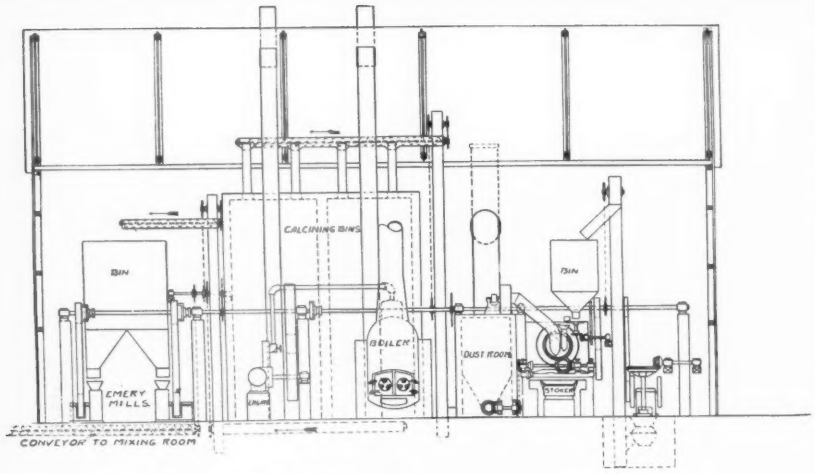
Samples of the dust which collected in the dust bins from the rotary calciner at the time the other sample was taken from the rotary stream were also tested. Also samples of the first settle material were reground by a burrstone (from 90 per cent passing a 100-mesh sieve) so that 98.5 per cent would pass through the same sieve. The results are given to show how this finer grinding increases the richness of the plaster.

The results given under each column in the table are averages of several tests made of each sample. It is noted that the second-settle material compares very closely as to density and strength with the fines or dust



General layout of a gypsum plant using rotary calciner

Materials	First Settle Calcined at 335 deg. F.	Second Settle Calcined at 440 deg. F.	Rotary Gypsum Calcined at 350 deg. F.	Dust From Rotary Kiln	First Settle Reground
Fineness of grind through 100 mesh	90.5 pct.	90.0 pct.	90.0 pct.	93.5 pct.	98.5 pct.
Percentage of mixing water	46.0	44.4	48.8	43.8	47.2
Setting time	29 min.	19 min.	22 min.	15 min.	27 min.
Dry bulk per 100 gr.	127 c. c.	124 c. c.	173 c. c.	121 c. c.	156 c. c.
Wet bulk per 100 gr.	109 c. c.	103.5 c. c.	120 c. c.	101 c. c.	116.6 c. c.
Tensile strength per sq. in., 14 days old	235 lb.	230 lb.	195.5 lb.	237 lb.	205.5 lb.
Compressive strength, 14 days old	703 lb.	827 lb.	680 lb.	740 lb.	.....



FRONT ELEVATION.

Elevation of a rotary calciner plant

collected during the rotary calcination, and that both these products have greater strength than either first settle or the product taken from the main stream from the rotary kiln. These results are consistent with the general behavior of gypsum which seems to show that the more water is driven off in calcination (unless the gypsum is completly dehydrated or dead-burned), the stronger will be the calcined product.

When the gypsum industry was in its infancy the manufacturers tried to put as strong a plaster on the market as possible regardless of operating costs, but at the present time the strength of the plaster is overlooked more than it should be, and the desire of the manufacturer is apparently first to make a rich-working, bulky plaster.

The contractor can be blamed for this condition as much as any one for the reason that he demands the plaster which works the richest and will carry the most sand, and in the majority of cases will destroy as much of the strength of the plaster that he dares to by adding as much sand to the plaster as he can and still leave enough adhesive quality in the mortar to stay on the wall.

For this reason first-settle plaster and the rotary product (either of which may have a tensile strength of at least 225 lb. per square inch) only are used as a body for wall plasters.

Common Conditions Which May Affect the Quality of the Kettle Product

In maintaining a uniform standard of quality while manufacturing either first-settle or second-settle gypsum, manufacturers are guided mainly by the setting time and the richness of the finished product. It seems to follow that if these two properties conform closely to a given standard that the material will have good strength.

A measure of the percentage of mixing water required to render the gypsum to a given working consistency is a reliable measurement corresponding to its richness.

Sorting Out Impurities

To guard against ununiformity of the finished product precaution should begin at the gypsum deposit. As much as possible of the darker hard rock containing anhydrite should be avoided, as anhydrite has been found to destroy the richness of plaster or, to use a common phrase of the plaster man, it makes plaster "short working" in the same respect that sand or any non-plastic material affects calcined gypsum. Anhydrite also accelerates the setting time of gypsum.

At deposits which are covered with only a few feet of clay, and are quarried, as much as possible of the overburden should be stripped off, and as much as practically possible of the clay should be cleaned from the rock before entering the crushers. A very small percentage of some clays will considerably darken the color of the plaster after calcination and weaken the plaster.

At most of the gypsite beds it requires men of experience to sort the gypsite from the clay and dirt, and in some Western localities considerable discoloration has resulted in the finished product caused by almost invisible streaks of alkali.

Drying an Important Step

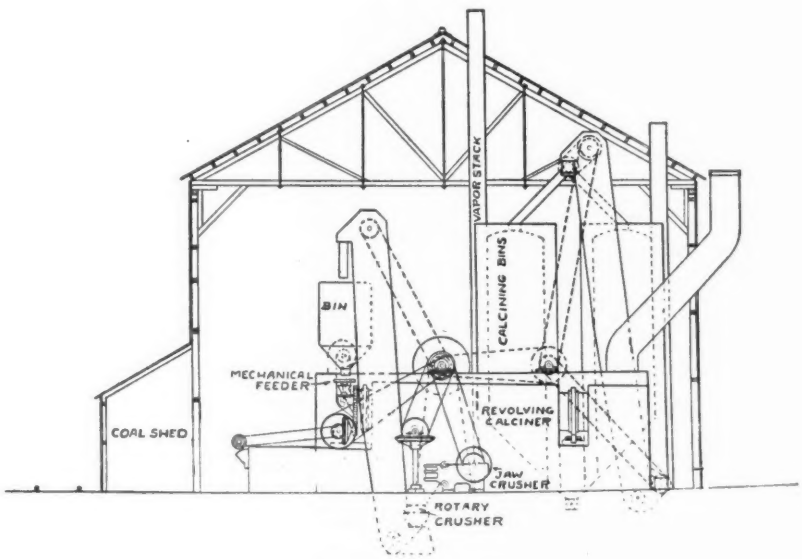
An important step in the process is that of drying. Gypsum rock dried to a certain point will grind easier than it will with an excess of moisture. If 3 or 4 per cent of water is driven from the stream in a drier, this effects a decided saving on the time of calcination. It means that each batch or kettle can be calcined in at least 30 minutes' less time.

While it is not a common practice at gypsum plants to equip a rock drier with a recording thermometer, a constant watch of the temperatures by this means has been found to insure more uniform firing and promote better results.

Importance of Fine Uniform Grinding

It is unnecessary to mention the importance of fine, uniform grinding. Finer grinding unquestionably makes a richer, more plastic material and to a small degree finer grinding (and more noticeably regrinding after calcination) proves to accelerate the setting time.

Coarsely ground material not only works "short," but it is not as desirable for the plate-glass trade and some pottery work for the reason that it causes damage by scratch-



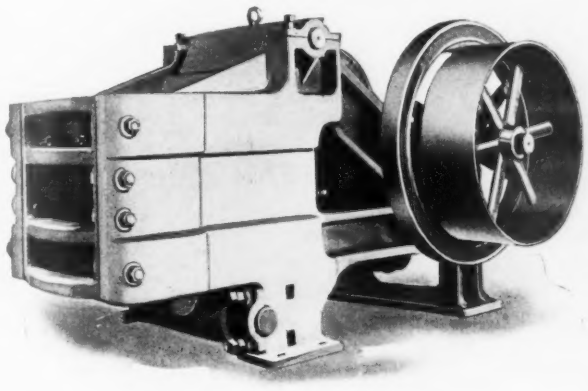
END ELEVATION.

Elevation of a rotary calciner plant

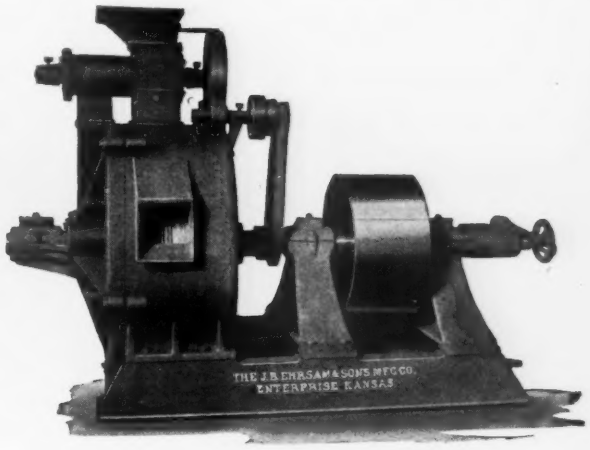
ing. Within certain limits, however, a coarser grind will make a stronger plaster.

Raymond mills are now common and have proven a very successful type of grinder for gypsum rock and have in many instances replaced the vertical and horizontal burr mills.

The tube or ball mill has also been introduced into the industry, but it has not up to this time proven very satisfactory except in handling very fine material. As a secondary grinder when an extremely fine product is desired, the tube mill has been found to work very well.



A jaw crusher for gypsum rock



A horizontal burr mill for grinding gypsum

Calcination

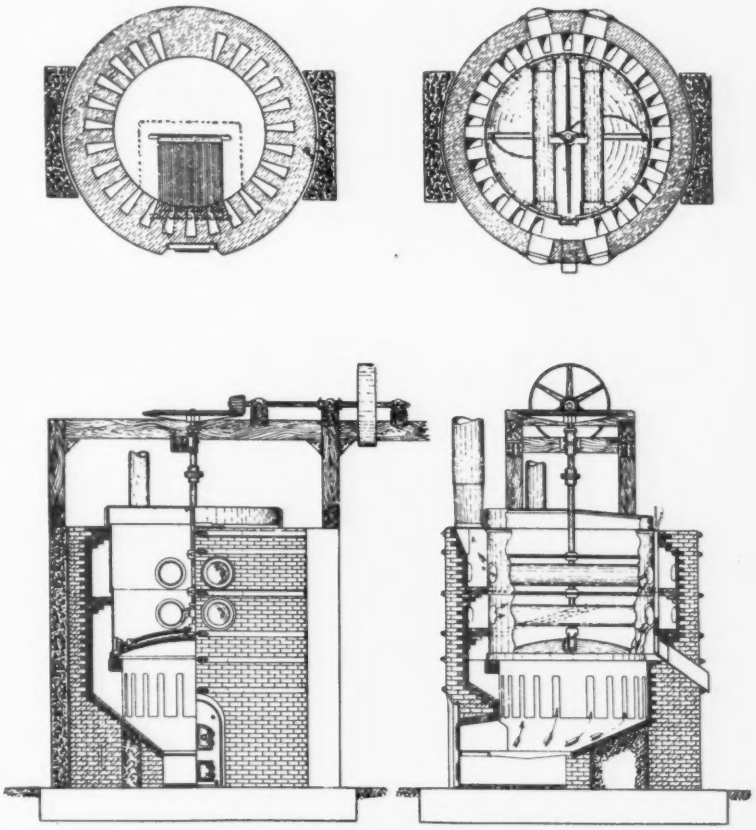
The temperatures required for first- and second-settle plaster have been stated in an earlier issue to be respectively about 330 and 430 deg. Fahr., with slight variations. While thermometers of the indicating type, as well as recording thermometers, are used in taking the temperatures, operators generally agree that more uniform results are obtained by "dumping" the kettle according to the appearance or clearness of the contents rather than when the temperature of the material has reached a certain definite point. There are necessary exceptions to this practice as in the case of the construction of some kettles which have flues too small to carry away the steam and dust fast enough.

Again, the surface of some gypsum during calcination does not clear perceptibly and in such cases the man who is responsible for the calcining must necessarily depend upon the reading of the thermometer rather than his own judgment in order to tell when to dump the batch. Thermometers of the recording type are easier to read and have proven more satisfactory in many ways than thermometers of the indicating type.

Each chart is an indelible record of production and a very good criterion of the quality. The chart shows the time and temperature of each batch calcined and indicates very accurately how fast each kettle was filled. It has been found important to keep these three conditions uniform in order to obtain a uniform product.

Gypsum calcined very slowly, even though not higher than a desired temperature, will not be as rich working and will set quicker than if calcined at the same temperature in less time.

The time of calcination may be affected not only by the rate of firing the kettle, but also by the condition or cleanness of the flues, the dryness of the raw gypsum, and to some extent the changes in the humidity of the air. It is also important that the kettles are not filled too fast as this condition is not only likely to stick or stop the revolving agitators, but in some cases causes portions of the damp gypsum to "bank" on top of the flues and remain uncalcined. When the kettle is dumped this uncalcined material loosens from its support and when mixed with the good plaster noticeably contaminates it.



A typical kettle installation for calcining gypsum

The danger of raw gypsum leaking through the kettle gates has been previously discussed in an earlier article.

The Hot Pits

When the gypsum is calcined and released by the kettle gates into the hot pits below, the material should not be allowed to remain too long in these pits, but as soon as possible should be brought into contact with the air by conveying and elevating to the plaster bins. The reason for this is that the hot calcined material will overcalcine by its own heat if allowed to be so closely confined in the unventilated pits.

(To be continued)

Using Explosives Economically

THE June issue of the *Explosives Engineer* is especially attractive and interesting to quarry operators. An article on "How to Avoid Waste of Explosives," by R. N. Van Winkle, general manager, Hawkeye Quarries Co., Cedar Rapids, Iowa, is both interesting and suggestive. Among other points Mr. Van Winkle makes is the following:

Educate your men in handling dynamite; teach them to think not in pounds of dynamite, number of caps or electric exploders, feet of fuse or Cordeau, but in dollars and cents. Take a little time some day and assemble all the men, from the superintendent down, who handle or use explosives and blasing supplies. Have a cartridge of every size explosive you use, a piece of fuse a foot long, a piece of Cordeau a foot long, one of each size blasting caps, and an electric exploder with the length wire most commonly used. Talk to them like a dutch uncle; explain to them that this one cartridge of 1¼x8 in. of special ammonia dynamite you are showing them is worth 7 cents; that this cartridge of 40 per cent 5x10 straight nitroglycerin dynamite is worth $1.47. Tell them that this insignificant little No. 6 copper blasting cap that you have in your hand costs 1½ cents, while just 1 ft. of fuse they are so generous in using costs 1 cent; that 1 ft. of Cordeau costs you 5 cents; that a No. 8 copper wire electric cap with 30-ft. wires is worth 18½ cents. These men have their hands deeper in your pocketbook than anyone around your operations, so teach them the value of explosives and supplies and encourage them to think in dollars and cents instead of pounds, feet, and number of caps and exploders and you will find a wonderful improvement in your blasting costs and dynamite and blasting supply consumption. The writer is a constant and firm believer in educating workmen, not only to think in terms of dollars and cents as far as explosives are concerned, but to teach the more apt employes how to figure tonnages in bank shots, how to figure explosives required per foot of drill hole, tons of stone per foot of drill hole in shots, hole spacings, etc.

When your powder monkey, or shooter, is of foreign extraction and unschooled, as is often the case, you can reach him with the dollars and cents idea, but where large shots are put off the writer makes it a practice to relieve the quarry superintendent from all other duties, and requires that he actually supervise all large shots; for, after all, the superintendent is the man most interested, as he is strictly accountable for final results and, therefore, must be in authority. Bank shots in our operations are platted on paper, depths of holes accurately measured, toe considered, and burden and spacing are checked. Then the superintendent comes in with this data and, with some other member of our organization, figures out the loadings for each of the holes which have been previously numbered on the plat or drawing.

Educating employes will surprise even the most skeptical employer, and if you can get men to thinking they need not expect promotion until they have made others to fill their places, you will soon be getting full value for your labor payroll.

The leading article in this issue is by Prince Gelasio Caetani, Italian ambassador to the United States, on "How We Captured Col di Lana—a detailed account of one of the most remarkable explosives engineering feats of the World War." Prince Caetani is a mining engineer who had several years' experience in his profession in the United States prior to the war.

Under-Burned Dolomite a Hydraulic Cement

A JAPANESE investigator, Saburo Kimura, has described in the *Journal* of the Japanese Ceramic Association a series of tests with dolomitic cement, made by underburning a silicious dolomite. It has long been known that an underburned dolomite had some slight properties of a hydraulic cement, but little use of that information has been made in this country.

According to these Japanese experiments the tensile strength of dolomitic cements which were prepared by calcining four kinds of Manchurian dolomite for several hours at 600-700 deg. C. and then by grinding them to pass through a 900-mesh sieve was tested. The strength and hydraulicity increase with its content soluable silica. Some of the results obtained with a dolomite containing 19.14 per cent soluble silica, 0.66 insoluble matter, 1.10 alumina and ferric oxide, 27.74 lime, 22.41 magnesia and 28.34 loss on ignition are shown below.

Proportion in weight					Tensile strength, kg./sq. cm.	
Calcined dolomite	Port. cement	Calcined pegmatite	Anzan slag	Sand	14 days	28 days
.....	1.0	.....	.....	3.0	17.9	25.0
1.0	.....	.....	.....	3.0	6.9	15.0
0.9	0.1	.....	.....	3.0	6.9	11.9
0.9	.....	0.1	.....	3.0	8.1	12.5
0.9	.....	.....	0.1	3.0	15.0	19.4

Thus, dolomitic cement with small addition of blast-furnace slag is a good hydraulic cement and can be used as a substitute for white portland cement, as it can be prepared nearly pure-white.

Testing of Explosives

TESTS are being made by the Department of the Interior at the Pittsburgh experiment station of the Bureau of Mines to determine the temperatures at which various explosives will detonate or flash. A series of tests has just been completed to show the effects of crystal size and method of purification on the strength and sensitiveness of T. N. T. Apparently both factors have some effect on the explosive properties of T. N. T., but the variation is within narrow limits.

Lime and Tuberculosis

FURTHER supplementing the belief that breathing lime and limestone is actually beneficial to sufferers from the "white plague"—an article appeared under this title in Rock Products for January 14, 1922, in which the opinions of the leading lime producers were cited—the following letter from Dr. George A. Olson, agricultural director of the Gypsum Industries, should prove of interest:

"Some time ago we received information from two sources that plaster of paris had been used as a means of curing tuberculosis. Apparently we had overlooked sending you the story which we received as a result of experiments conducted at Great Neck, Long Island, N. Y. The story as published in the newspapers is as follows:

Dr. F. Tweddel of Great Neck, L. I., read a paper at the Academy of Medicine in New York, in which he recommended inhalations of the dust of lime and plaster of paris for pulmonary tuberculosis. He said all men employed in making these products are always free from tuberculosis.

He uses a powder-blower half filled with ordinary plaster of paris. The blower is held at arm's length and the dust is inhaled. By such inhalations the calcium is carried to every part of the lungs and acts as an alkaline and antiseptic.

"I am sure that you will be interested in this bit of information in view of the fact that you have made quite an exhaustive study on the possible value of calcium in the prevention of tuberculosis.

"Recently some discussion has been presented dealing with the nature of the soaps within the body. It apparently makes a considerable difference whether the soaps are of calcium or alkaline nature. In case of the calcium soap we have water in the soap and in the case of alkali soap we have soap in the water, giving us two different kinds of soap, one of which is favorable for the conducting of electrical charges.

"Some doctor has presented the theory that nervousness is due largely to the possibility of the rate of conducting charges.

"I hope to find time to give some attention to this question because I believe some of the problems most valuable in connection with the well being are tied up in colloidal properties of the body. In completion of this source of information I will be pleased to give you the results of my findings."

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation

THE TECHNICAL STAFF OF ROCK PRODUCTS

Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates

Gordon Smith, First National Bank Bldg., Chicago, Ill., Expert on Crushing and Cement-Plant Problems

No. 70. **Power for Sand and Gravel Plants.**—We are thinking of building a sand and gravel plant in an isolated situation which is not near any electric power line. It will cost about the same amount to build a pole line in to the plant as it would to install our own power plant. Which would you advise? What do you think of oil engines for power and what make would you recommend?—J. A. W.

A. The first question cannot be answered without more data than are given in your letter. There are very wide variations in the prices both of electric power and fuel in various parts of the country. The kind of contract for electric power that the company would be willing to make would be important. But, other things being equal, the writer believes that preference should be given to electric power—in fact, that electric power should be chosen even where the cost is somewhat higher. The convenience of electric power and its reliability are worth something. Oil engines of the semi-Diesel type have given excellent results as prime movers for sand and gravel plants. The modern types are thoroughly reliable machines. They handle about as easily as a steam engine and produce power at a very low cost. There are several makes of these engines on the market from which you could choose without going wrong.—E. S.

No. 71. **Are the Uses of Lime Increasing?** What does "A. B. C." and "A. B. P." mean? Will you please tell me if the uses of lime and the demand for it are increasing or decreasing? What is the meaning of "Member of A. B. C." and "Member of A. B. P." as used on the front cover page of Rock Products?—B. S. D.

A. We know of no better proof of the fact that the uses of and demands for lime are on the increase—and that the possibilities for future increase are truly tremendous—than to call your attention to the June 30, 1923, issue of Rock Products. It reflects not only the great progress made in the development of the lime industry, but it shows the wonderful future of lime. By referring to the proceedings in that issue of the National Lime Association in convention at New York City June 13-15, you will get a very lucid statement of what is being done by the producers for this industry. According to the statistics of the United States Geological Survey, the amount of lime produced in 1922 was about 50 per cent greater than in 1921, and there is every prospect that the 1923 production will be 50 per cent greater than 1922. "A. B. C." stands for "Audit Bureau of Circulations." It is an organization supported by publishers and advertisers to audit and guarantee the circulation of reputable trade journals. The "A. B. P." stands for "Associated Business Papers." This is an association of publishers who subscribe to the following principles:

The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself: 1. To consider first the interests of the subscriber. 2. To subscribe to and work for truth and honesty in all departments. 3. To eliminate, insofar as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive. 4. To refuse to publish "puffs," free reading notices or paid writeups; to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it a real news?" 5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity. 6. To solicit subscriptions and advertising solely upon the merits of the publication. 7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements, subject to proper and authentic verification. 8. To co-operate with all organizations and individuals engaged in creative advertising work. 9. To avoid unfair competition. 10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.—N. C. R.

At Your Service!

ALL INQUIRIES addressed to this department are considered confidential. We answer them at once by letter. Such inquiries and answers as are of general interest are afterwards published in part or as a whole on this page.

Every reader is invited to send inquiries and we welcome corrections in published answers. We do the best we can, but we know others with wider experience can give more adequate or accurate answer. to many of these questions. Rock Products readers, this is your page! Please use it.—The Editors.

No. 72. **What Is the Best Type Crusher to Handle Slate?** I wish to know the best type of crusher equipment to handle slate. We are now using a No. 6 gyratory crusher together with 2-ton cars. We are troubled with the bridging of the crusher which necessitates pulling back the slabs and refeeding. The slabs vary up to 2 ft. wide, 3 ft. long, and 4 in. thick, so we must have two men to pull the slabs back and forth.—H. L. P.

A. As to the best type of crusher for the purpose you mention, I believe that the tooth rolls or slugger rolls would best serve your purpose. This is the type of crushing machinery generally used for coal breaking. Rock Products had quite an elaborate article on the reduction of slate granules written by H. A. Megraw, an expert crushing engineer, in the issue for September 10, 1921. In this article he recommends as a primary breaker either a gyratory crusher, such as you have, or a jaw crusher. I am quite sure that with either of these types the slabs as thin as you are producing would give some trouble in the crusher. Some type of roll crusher is what the conditions call for.—N. C. R.

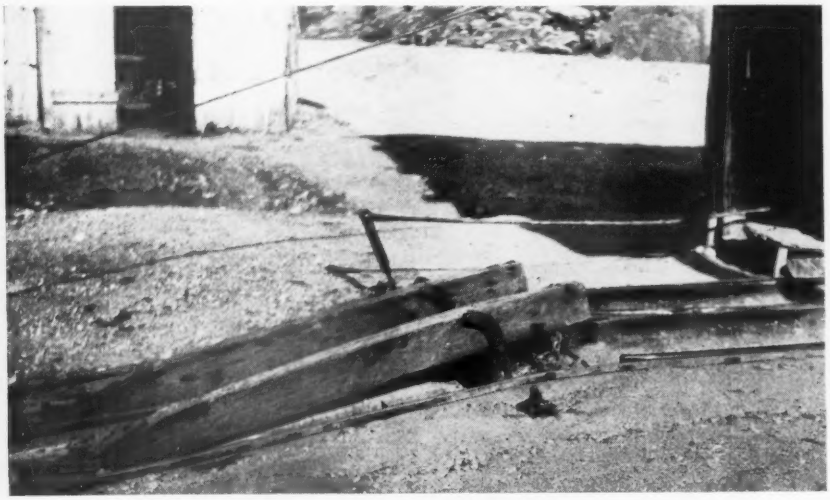
No. 73. **How Foundry Sand Is Classified and Where It Is Found.**—Please tell me the classifications of foundry sand, and where it is found.—E. G.

A. Foundry sands include: 1. Sands for making the mold proper into which the metal is cast; 2. core sand, utilized for making the cores which occupy the hollow spaces of the cast piece. Molding sands proper are usually of finer texture and of more loamy character than the core sands, still the two grades overlap and both show a considerable range of texture. In selecting molding sands the finer-grained sands are used for small castings, while the coarser grades are employed for heavy castings. The core sands have but little cohesiveness, owing to their lack of clayey matter, and hence require the addition of an artificial binder. The requisite physical qualities of foundry sand are: 1. Sufficient cohesiveness to make the grains adhere when pressed together to form the parts of the mold, the deficiency in this respect in core sands being supplied by artificial binders; 2. Sufficient refractoriness to prevent extensive fusion in the sand when exposed to the heat of the molten metal; 3. Texture adapted to the grade of casting to be poured in it; 4. Sufficient porosity and permeability to permit the escape of the gases given off by the cooling metal; 5. Durability, or sufficient length of life, to permit as much of the sand as possible being used over again. A laboratory examination of a molding sand might properly include the determination of (1) its texture (by mechanical analysis), (2) porosity, (3) permeability (by aspirator method), (4) average fineness (by aspirator method, for other methods are less accurate), (5) tensile strength, and (6) refractoriness. Fine sand and coarse gravel sand can be found at Richmond, Va.; stove plate sand at Albany, N. Y., and Newport, Ky.; brass sand both mild and strong, at Lumberton, N. J.; there are upper and lower sand beds at Rockton, Ill., and stove plate sand at Conneaut, Ohio. Other sands can be found at Jackson, Mich.; Zanesville, Ohio; Riverside, Niles, Vineland, Leoni, Battle Creek, Mich.; Newport, Ky.; Manchester, Richmond, Petersburg, Va.; Berlin, Janesville, Kenosha county, Wis., and Waterford, Ill.—H. E. H.

Hints and Helps for Superintendents

Safety Block on Incline

CARLOADS of material at most operations having inclined railways are pulled up the incline from the quarry, pit, or unloading dock to the plant. At the Gager Lime and Mfg. Co.'s operation, however, this method is reversed, for the quarry is on the top of a mountain and the plant is at the bottom. Thus, the loads go down and their weight brings up the empties.



This type of safety block, on an incline where loaded cars are let down, is simple in its construction and positive in its action

The loaded cars are pulled from the quarry to the top of the incline by mules and when a car is within 100 ft. of the top the mule is unhitched and the car travels to the scales by gravity, the track having a grade of but 1 per cent. This is so slight that by the time the car passes on to the scale-platform it can be easily stopped by one man.

In the event that there is no one in attendance at the scales and a car should come down from the quarry, there would no doubt be a serious accident, for the car would go "wild" down the incline, endangering lives as well as destroying equipment.

To prevent such an accident, the company has installed a safety block at the top of the incline which is raised as soon as a loaded car goes down, so that should a car get away in the quarry it would be stopped with only slight, if any, damage.

This safety device is comprised of two 4x6-in. hardwood timbers, 6 ft. long, placed endwise in the track at top of the incline. At the lower end these are individually braced and are hinged to timbers driven into the ground. At the upper end, or the end closest to the scales, a heavy iron rod extends under them which has on either end an arm about 6 in. long. Attached to one of these is a 12-in. lever which is connected by a ¾-in. round rod to a hand lever near the scales. By moving the lever forward the rod underneath the timbers raises them. After the lever is moved forward it is held in place by a bolt passing through it and a hole in one of the joists of the scale-house.

This device has been in use for several years and in that time it has seldom been put into actual service. Nevertheless, it is used constantly and in this way all possibilities of an accident from such a source are eliminated.

A Tool to Remove Bolts

IT is frequently necessary to remove or tighten button-headed bolts on which the nuts have rusted during the maintenance of timber bridges. When these bolts are loose and the threads badly corroded a sufficient grip must be had to keep them from turning while the nut is being started. If a pinchbar is used, the timber is damaged.

A bridge carpenter has devised a tool which is a 1-in. steel bar 33 in. long, one end flattened to form a tapered end 4 in. wide through the heavy section and having a V-shaped notch in the end to fit over the bolthead, the bar end being ground to a point and the sides of the notch to a cutting edge.

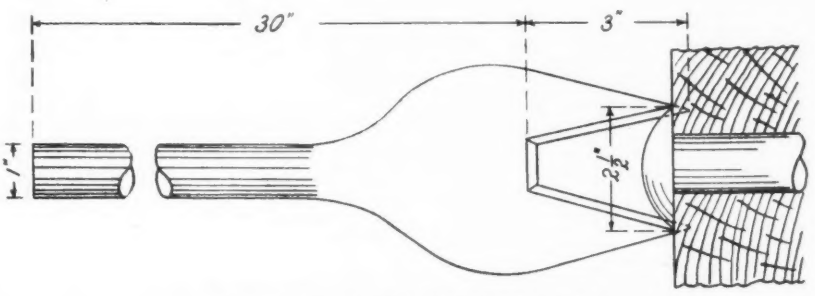
The loose-bolt end is held fast by driving the bar into the timber far enough to cut into the edge of the bolthead, the width across the notch at the point being wider than the bolthead so that the points will penetrate into the timber before striking the bolthead. This avoids the tendency to slip off when driving. The tool is said to have worked very satisfactorily in work of this kind.

How to Utilize Your Old Firebrick

THE life of furnace walls made of refractory material may be greatly extended at a slight cost by means of a method developed by James A. Faulkner of Cleveland, Ohio, recently noted in *Power*.

According to this method old firebrick are first ground to a fine powder. Small amounts of high-grade fireclay and ground silica are then mixed in to form a binder. A mortar is made of this mixture. This makes a good mortar for laying up a new wall. In connection with an old furnace, the wall is coated with a layer of this material from ¼ to ½ in. thick. With boilers operated at high rating, this layer is renewed every 30 days or as often as may be necessary, and the wall maintained indefinitely. At least twice the ordinary life of the brick is obtained in this way.

In repairing furnace walls, arches and monolithic work in general, the first opera-



How the guard-rail bolt holder is applied

tion is to fill up the spalled portions with coarsely ground firebrick made plastic by the addition of water. After bringing the wall back to its original thickness in this way, it is coated with cement solution with either a trowel or cement gun. This cement solution is used to bind the mortar to the brick surface. Esso Bond No. 35 or No. 32 fine cement is used to do this work.

The mortar itself is prepared by grinding brickbat in such a mixing and grinding machine as the putty chaser. A bonding clay with a fusing point around 3100 deg. Fahr. is added, along with a small amount of finely ground silica ganister. For making the material plastic, sodium silicate is used. The one item of expense in using this method, which is practically unavoidable, is the installation of a mixing and grinding machine. No other means is available for bringing about the intimate mixture of the ingredients of the mortar that is necessary to a successful application.

However, where there is much repairing to be done, this method has much to recommend it, since the cost of maintaining furnace walls in this manner is only a fraction of that which is necessary when they are entirely rebuilt at frequent intervals as is common practice in many places.

Plants using this method most successfully repair at frequent periodic intervals of possibly 30 days, whether any extreme need for repair is discovered or not.

Pumping From Ten Wells With One Pump

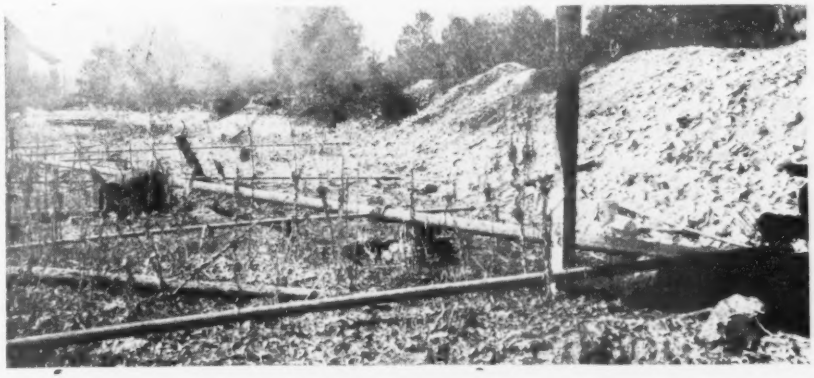
WATER IS SCARCE at the Plant City Brick Co.'s plant at Plant City, Fla., and it is impossible to obtain enough from any one well to supply the amount necessary to carry on the hydraulicking in the pits.

To overcome this difficulty, C. W. Wilkerson, general superintendent, decided that the only solution of the problem was to dig several wells and install small pumping units at each one to pump into a large line leading to the pits.

Before purchasing enough small pumps to answer this purpose, the idea presented itself of pumping from all the wells with *one* pump. Having on hand an old 7x5x7-in. duplex, piston-pattern steam pump with a 4-in. suction and 3-in. discharge, the idea was tried out.

Ten wells, averaging 16 ft. in depth, were dug in two rooms of five each, spaced approximately 15 ft. apart. A 4-in. suction line, 60 ft. long, was extended from the pump running between the two rooms. This was fitted with crosses every 15 ft., two sides of which were bushed to 1¼ in. From these, lines were extended to the wells, thus affording ten 1¼-in. suction lines emptying into one 4-in. line.

The experiment was productive of better results than were anticipated, for with the arrangement the pump furnishes a full 3-in. stream at the pits, delivering it at the nozzle at a pressure of 100 lb.



Ten 1¼-in. lines, each leading to a well, branch off of the 4-in. suction pipe of a 7x5x7-in. pump

A Home Made Conveyor Loader

ANOTHER PIECE of homemade equipment designed by Superintendent Hoback, of the Gager Lime and Mfg. Co., Sherwood, Tenn., is a conveyor loader which is used for the loading of bulk lime into box cars.

This machine, illustrated herewith, is made up entirely of parts obtained from the scrap pile—excepting the motor. The motor and the lower end of the loader are mounted on a small wooden truck having four 6-in. wheels taken from hand trucks. The frame, which is of timber construction, is 18 ft. long. On its underside, about 6 ft. from the lower end, is mounted a 1 7/16-in. shaft fitted with a 14-in. steel pulley having a 3-in. face. This is belt-driven direct from the motor's 4-in. pulley. The opposite end of the shaft is fitted with a 6-in. sprocket which is chain-connected to the head pulley at the upper end of the frame.

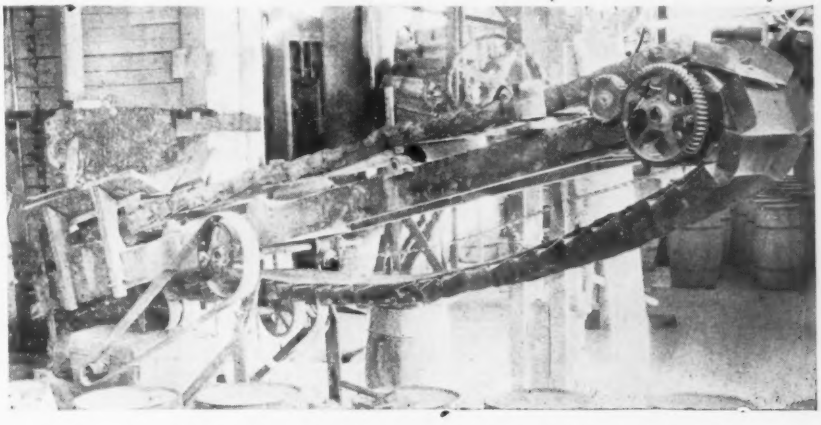
Directly under the driving shaft is a steel support, made up of ½x3-in. flat bars. This takes care of the greater part of the loader's weight and also serves as a support for a pair of return idlers. The belt was also taken from the scrap pile, having served previously as a transmission belt in the plant.

THIS MEANS YOU

THIS is a special invitation to all operators to send in "Hints and Helps" material. Let Rock Products be your medium of exchange. Your neighbors' plants have netted material for these pages for several years and now it's YOUR turn. Merely send a sketch or photo and an explanatory note. We'll do the rest. We pay for 'em.

It is 14 in. wide and is fitted with steel plates 10 in. wide turned up at the sides to prevent spillage.

The motor is of 7½ hp. and current is supplied through one cable, of which there is sufficient surplus to permit moving the machine about the plant. The loader is functioning satisfactorily after several months of service.



This homemade conveyor loader is made up entirely of parts obtained from the scrap pile

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert,
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning July 8:

Central Freight Association

6700. Crushed Stone, Sibley to Detroit, Mich. Present, 60 cents per net ton. Proposed, 70 cents.

6701. Sand and Gravel, Cleves, Ohio, to Erlanger, Ky. Present, 60 cents per net ton. Proposed, 65 cents.

6702. Crushed Stone, Fultonham to Dalton, Ohio. Present, 6th Class. Proposed $1 per net ton.

6703. Cement, Common, Hydraulic, Natural or Portland, New Castle, Pa., to West Sutton, W. Va. Present, 18½ cents. Proposed, 17 cents.

6709. Sand, Erie to Rochester, Buffalo, Salamanca and Dunkirk, N. Y. Sand (other than blast, engine foundry, glass, molding or silica) in C. L.

To	In cents per net ton Present	Proposed
Rochester (proper), N. Y.	250	220
Buffalo (proper), N. Y.	*126	115
Salamanca (proper), N. Y.	139	125
Dunkirk, N. Y.	*110	90

*Lake sand and gravel.

Sand, viz., blast, engine, foundry, glass, molding or silica, in C. L.

To	In cents per net ton Present	Proposed
Rochester (proper), N. Y.	250	240
Buffalo (proper), N. Y.	.....	130
Salamanca (proper), N. Y.	139	140
Dunkirk, N. Y.	.....	100

6724. Sand and Gravel, Urbana to Utica, Hunt, Belleville and Lexington, Ohio. Present, 15 cents to Utica and Hunt and 16 cents to Belleville and Lexington. Proposed, $1 per net ton.

6733. Sand and Gravel, Ligonier, Ind., to Illinois, Indiana, Michigan and Ohio, Present, 6th Class. Proposed:

To	Cents
Ligonier, Ind	40
Brimfield, Ind.	60
Corunna, Ind.	63
Butler, Ind.	76
Edgerton, Ohio	84
Bryan, Ohio	84
Archbold, Ohio	84
Wauseon, Ohio	84
Holland, Ohio	88
Toledo, Ohio	88
Millersburg, Ind.	69
Middlebury, Ind.	70
Elkhart, Ind.	70
Mishawaka, Ind.	77
South Bend, Ind.	77
New Carlisle, Ind.	77
La Porte, Ind.	77
Chicago, Ill.	*77
White Pigeon, Mich.	80
Sturgis, Mich.	70
Bronson, Mich.	76
Bankers, Mich.	88
Montgomery, Mich.	88
Fremont, Ind.	88
Angola, Ind.	76
Summit, Ind.	76
Auburn Junction, Ind.	63
Coldwater, Mich.	82
Jonesville, Mich.	82
Hillsdale, Mich.	88

*N. Y. C. delivery only.

New England Freight Association

4862. Granite Chips, minimum weight 60,000 lb., from Barre to White River Junction, Vt., $1.10 per net ton. Reason: To place C. V. railway on parity with the B. & M.

4863. Sand, minimum weight as per O. C. from Massapeag to Guilford, Branford and Mystic, Conn., $1.25 per net ton. Reason: To meet competition of barge route via L. I. Sound.

Southern Freight Association

10385 (carrier). Minimum C. L. weight on sand in connection with rates from Junction City, Ga., and other A. B. & A. stations to various Alabama and Georgia points. The present minimum weight on sand published by A. B. & A. from Junction City, Ga., and other A. B. & A. stations in that vicinity to various Alabama and Georgia points when in cars of less than 70,000 lb. capacity is the marked capacity of the car if loaded to full visible capacity. It is proposed to make the minimum weight uniformly 10 per cent less than marked capacity.

10387 (shippers). Slag, C. L., minimum weight 90 per cent of capacity of car, except where cars are loaded to their visible capacity, actual weight will govern, from Alabama City to Miami, Fla. No through rate at present in effect, combination applies. Proposed rate, $4.50 per net ton.

10445 (carrier). Sand and Gravel, straight or mixed, carload minimum weight 90 per cent of marked capacity of car, except when cars are loaded to full visible capacity actual weight will govern, from Montgomery, Ala., to Panama City, Fla. At present no through rates in effect. Proposed rate $1.97 per net ton.

10463 (shippers). Crushed Stone, minimum weight 90 per cent of marked capacity of car, except when cars are loaded to visible capacity actual weight will govern, from Cumberland Furnace to Pond, Tenn. At present class rate applies. Proposed rate 75 cents per ton of 2000 lb. Proposed rate same as at present applicable from Newson, Tenn.

10470 (shipper). Slag, from Goodrich to Jackson, Tenn. Present rate, $1.13 per ton 2000 lb. Proposed rate, $1.02 per ton 2000 lb.

10473 (carriers). Sand and Gravel, from Columbus, Bull Creek Siding, Concrete and Killens, Ga., to Albany, Ga. Present and proposed rates are: From Columbus, Bull Creek Siding and Concrete, Ga., present, 90 cents, proposed, $1.04; from Killens, present 81 cents. It is proposed to cancel present rate from Killens account no movement. Recently a revision was made in the rates on sand and gravel from Montgomery district to Albany, Ga., and the purpose of this revision is to place Columbus district upon the proper relationship.

10491 (shippers). Cement, natural or portland, from Portland and Rockmart, Ga., to Key West, Fla., when for export to Cuba. Present rate, 17 cents per 100 lb. Proposed rate, 16 cents.

10495 (cancels 10463) (shippers). Crushed Stone, C. L., from Cumberland Furnace to Pond, Tenn. At present, class rate applies. Proposed rate, 68 cents per ton 2000 lb.

Southwestern Freight Bureau

8797 (1). Cement. To establish rate of 20½ cents per 100 lb. on cement, carloads, minimum weight 50,000 lb. from Harrys and Eagle Ford, Texas, to Muskogee, Okla. Remarks: It is claimed that the proposed adjustment is necessary to place rates from Harrys and Eagle Ford, Texas, to Muskogee, on a proper relation to rates from Kansas City to the same destination.

8813 (1). Chatt. To establish the following minimum weights on chatt, carloads, from Alva, Asbury, Aurora, Carthage, Granby, Joplin, Neck City, Orongo, Purcell, Webb City, Cartersville, Mo., to stations in Missouri and Kansas named in Mo. Pac. R. R. Trf. 1464F: 90 per cent of marked capacity of car, except that when weight of shipment loaded to full visible capacity of car is less than 90 per cent of marked capacity of car, the actual weight will apply; but in no case shall the minimum carload weight be less than 40,000 lb. Remarks: It is claimed that the proposed change in minimum weight is necessary to take care of the loading of chatt into low side Eastern line cars that find their way to the Southwest, it being impossible to load enough chatt on these cars to meet marked capacity weight.

Amendment 1 to 8587 (Bulletin 191). Portland Cement. To establish rate of 21 cents per 100 lb. on portland cement, carloads, minimum weight 50,000 lb., from Ada, Okla., to Cedar Grove, La.

8893 (1). Cement. To establish the following rates in cents per 100 lb. on cement carloads, minimum weight 50,000 lb., from Ada, Okla., to points in Texas shown below:

To	Rate cents
Wichita Falls	25
Lake Wichita	25
Huff	25
Lukewilson	25
Archer City	25
Anarene	25
Olney	25
Orth	25
Newcastle	25
Bullock	25
Graham	25
South Bend	33
Fliasville	33
Timburn	34
Gudger	34
Breckenridge	34

Remarks: It is claimed that lower rates are applicable at Breckenridge and Eliasville than at intermediate points.

Transcontinental Freight Bureau

3974 (shippers). Cement, C. L., W. B. Request for rate of approximately 30 cents per 100 lb. from Kansas and Colorado producing points to California points, under Tariff IV (I. C. C. A90, 1333 and 1114 of W. S. Curlett, B. T. Jones and R. H. Countiss, agents, respectively).

Trunk Line Association

11478 (shippers). Cement, Common, Hydraulic, Natural or Portland, C. L., minimum weight 50,000 lb., except when for carriers' convenience cars of less capacity are furnished, in which case minimum weight will be marked capacity of car furnished, but in no case less than 40,000 lb., from stations in Lehigh district to Philadelphia & Reading stations, Ewing, Hopewell, Manville, Fort Reading, N. J., and other points, 12½ cents per 100 lb.

11482 (shippers). Cement, Common, Hydraulic, Natural or Portland, C. L., minimum weight 50,000 lb., from Portland Point, N. Y., to Long Island railroad stations, taking Group A, 17 cents; Group B, 19½ cents; Group C, 20½ cents, and Group D, 23½ cents per 100 lb.

M360 (carriers). To increase rates on Cement, Common, Hydraulic, Natural or Portland, in packages, C. L., minimum weight O. C., from Martins Creek, N. J., to Pennsylvania to Watkins, Montour Falls and Burdett, N. Y., 15½ cents per 100 lb. (File 16021).

M361 (carriers). To cancel existing commodity rates on silica sand from New York and New York rate points to points beyond Western termini of trunk lines. (File 16372.)

Western Trunk Line

3234. Sand (except asbestos sand) Gravel, Crushed Stone, Clay, Soil, Cinders, etc. Between stations in Kansas on intrastate and interstate traffic. Present and proposed rates for representative distances:

Miles	Kansas Intrastate Present Single line	Two lines
5 miles and under	3½	4½
25 miles and over 20	3½	4½
50 miles and over 45	4	5
75 miles and over 70	4½	5½
100 miles and over 95	5	6
150 miles and over 145	6	7
200 miles and over 190	7	8
300 miles and over 280	9	10
400 miles and over 380	11	12
500 miles and over 475	13	14
600 miles and over 575	13	.....

	Present Kansas Intrastate 3 or more lines	Kansas interstate
5 miles and under	5	
25 miles and over 20	5	
50 miles and over 45	5½	No
75 miles and over 70	6	rates
100 miles and over 95	6½	other
150 miles and over 145	7½	than
200 miles and over 190	8½	class
300 miles and over 280	10½	rates.
400 miles and over 380	12	
500 miles and over 475	14	
600 miles and over 575	.....	

	Proposed Single line	Joint line
5 miles and under	3	3½
25 miles and over 20	3½	4
50 miles and over 45	4	5
75 miles and over 70	5	5½
100 miles and over 95	5½	6½
150 miles and over 145	7	7
200 miles and over 190	8	8½
300 miles and over 280	10	10½
400 miles and over 380	11½	12
500 miles and over 475	13½	13½
600 miles and over 575	15½	15½

Minimum weight 90 per cent of marked capacity of car, but not less than 60,000 lb.

Notice of Cancellation

Refer to Docket Bulletin No. 575 dated November 16, 1922, Docket No. 2812, covering "Lake sand, C. L., from Michigan City, Ind., Grand Haven, Muskegon, Ludington, Manistee and Frankfort, Mich., to Wisconsin points." This subject is hereby cancelled from the docket.

New Film Pictures Cement Making

MUCH of the equipment needed in making cement is shown in a two-reel picture, "The Story of the Manufacture of Portland Cement," recently released for general showing. It starts with views of one of the large cement plants, the film picturing in a non-technical way the essential steps in transforming the raw material into cement. From the moment a blast breaks loose a cliff of limestone in the quarry to the time when the finished cement goes into storage in the concrete bins, is almost entirely mechanical.

In addition, animated drawings have been inserted to make clear what occurs inside the grinding mills; what goes on within the white-hot interior of the huge kilns, and how the sacks, suspended upside down, are filled after they have been tied.

This film can be secured without charge by interested organizations through any office of the Portland Cement Association or from association headquarters at 111 Washington Street, Chicago, Ill.

Asbestos Sand Admitted Free of Duty

ASBESTOS sand, invoiced as asbestos and classified as a mineral substance wholly or partially manufacturers, at 20 per cent advalorem under paragraph 81, act of 1913, was claimed free of duty by the importer, G. W. Sheldon & Co., Chicago, in protest 962019 as sand under paragraphs 614, as asbestos unmanufactured under paragraph 406, or as a crude mineral under paragraph 549.

The protest has been sustained before Board 1 of the Court of General Appraisers and the goods were admitted free as unmanufactured asbestos.

Ft. Worth, (Texas) to Have Two New Cement Plants

PRELIMINARY construction and work on the final plans for one cement mill, and notification of an early visit by officials of a second, following a favorable report on the site under option, represents the present status of the two cement mill projects now being worked out at Ft. Worth, Texas, according to Roscoe Ady of the Ft. Worth Chamber of Commerce.

Plans for the first mill, that of the Southwestern Portland Cement Co., now operating mills in El Paso and Los Angeles, will be finished and actual construction work will begin in the next 60 or 90 days, according to information from officials of the company. A spur track from the H. & T. C. is now being run to the recently purchased site which cost $100,000.

The second group, the Ft. Worth Portland Cement Co., backed by New York capital, now have about $25,000 tied up in the site for their plant—a sum which will be much increased by the exercise of options expected following the visit of officials, probably next week. This site has just been reported on favorably by a consulting engineer sent here by the company.

Major Bartlett Heads the Harding Escort Committee

THE chairman of the escort committee for the reception and entertainment of President Harding's party, when the President visited Kansas City a few days ago,

Major Charles W. Bartlett, president, Kaw River Sand Co.

was Major Charles W. Bartlett, president of the Kaw River Sand Co.

Major Bartlett is a World War veteran. In Rock Products for August 13, 1921, it is mentioned that he, with Mrs. Bartlett and their daughter, went to France with an American Legion party of 200 as guests of the French government. He was chairman of the distinguished visitors' committee of the Legion and also a member of the commission which Governor Hyde appointed to acquire a site for a monument in France for Missouri's war dead.

Both Major Bartlett and his son served with the American Expeditionary Forces in France.

Dr. Holmes Resigns as Chemical Director of the National Lime Association

MAJOR E. HOLMES, Ph. D., has resigned from the office of chemical director of the National Lime Association. Dr. Holmes was appointed as head of the chemical department of the National Lime Association in October, 1920.

He is a graduate of Indiana and Cornell universities. His industrial experience, quoting from Rock Products of October 23, 1920, "has extended to practically all departments of a manufacturing plant, but has been particularly along the lines of technical control of factory production, development of new products, and the direction of technical research, and the preparation of technical literature."

Dr. Holmes is a member of the American Chemical Society and other scientific organizations. Dr. G. J. Fink, who has been Dr. Holmes' associate on research work for the association, has been appointed head of the chemical division, effective July 1.

Bedford Stone Producers Lose Case

JUDGE Z. E. DOUGAN in the Hendricks Circuit court sustained Indiana's anti-trust suit against 14 defendant stone companies. The defendant companies have been using the International Cut Store Contractors and Quarrymen's Association of Indianapolis and the Bedford Stone Club Auxiliary, Inc., as means to cover violations of the state anti-trust law, according to the findings of the court. The court ordered the international organization to leave the state, directed the club to go out of business, and found against the defendants.

The defendant companies are the Bedford Cut Stone Co., Imperial Stone Co., Consolidated Stone Co., Central Oolitic Stone Co., J. P. Falt Co., Furst-Kerber Cut Stone Co., J. Hoadley Stone Co., Interstate Cut Stone Co., Matthews Brothers, Perry Stone Co., John A. Rowe Cut Stone Co., Shea & Donnelly Co., Henry Strubble Cut Stone Co. and C. Ittenbach Co.

New Zealand Operator Visits American Quarries

WHILE visiting various quarry operations in the United States, F. N. Rhodes, assistant works manager of the Wilsons Portland Cement, Ltd., Auckland, New Zealand, paid a visit to Rock Products on July 8.

Mr. Rhodes' company operates a quarry at Auckland in which the face runs from 200 to 300 ft. high, and therefore he is interested in the American methods of drilling. He is also making a general study of our quarry operations, cost accounting, and the like, and will visit many of the larger operations while in this country. He is at present in the East.

A Correction

IN the article, "Pictorial Record of a Blast," appearing in Rock Products for April 7, 1923, it was stated that "the blast holes were made with a Cyclone well drill." The drill employed and shown in the illustration was the Clipper drill, manufactured by the Loomis Machine Co., Tiffin, Ohio.

Changes in American Lime and Stone Co. Personnel

THE following changes have been effected in the organization of the American Lime and Stone Co., Bellefont, Pa., according to the Bellefonte *Democrat:*

Irving Warner, who came to Bellefonte last year from Wilmington, Del., to become general manager of the American Lime and Stone Co. plant here, in the deal in which the local company and the Warner interests were associated under an option plan, expects to return to Wilmington this fall, possibly about the middle of September. He will be succeeded by W. R. Phillips, of Washington, D. C., who has been general manager of the National Lime Association. Mr. Phillips will come to Bellefonte about July 1, but he will not become general manager at once; his duties will start in about two months after he has become familiar with the local work.

Mr. Warner will be in charge of construction and engineering for both the Warner and American Lime and Stone Co., at Wilmington. In a business capacity he will have occasion to visit Bellefonte at intervals. During the short time he has been located here, he has made some staunch friends by his crisp and progressive business attitude.

John Curtin will become sales office manager in Bellefonte, C. B. Nicholson being transferred to Pittsburgh, where he will be sales manager of the Western district, which territory is one of the most promising business fields of the associated lime companies.

An announcement in the *Warner-American News* for July under the heading, "Welcome, Bill Phillips," states:

It is with a great deal of pleasure that the *News* announces that William R. ("Bill") Phillips will join the forces of the American Lime and Stone Co. early in July.

Mr. Phillips is a man of pleasing personality, of broad experience in business and plant operating problems. During the past year he has served as general manager of the National Lime Association, thereby gaining added insight into the problems affecting the lime industry.

It is at present the plan of the Warner-American executives to have Mr. Phillips spend about three months in becoming thoroughly acquainted with the leases and operating problems in the American company and then, on or about October 1, to have him assume the position of general manager of the company, specializing on the operating and sales problems of the organization.

The work of the American company has become so extended that it has been decided by the Warner-American executives to work towards applying the experience and energy of Irving Warner more specifically to the engineering, designing, construction and general scientific and technical problems of both the Warner and the American companies. It is for this reason that Mr. Phillips has been brought into the organization.

To those who have not had the pleasure of meeting "Bill," we commend him heartily, knowing that you cannot help but like him, for he is "on the square." Those who have met him we know will join with the *News* in extending to him a hearty welcome and a promise of co-operation to help put the American company in the front ranks among the lime manufacturers of the United States.

Also the *News* extends to Irving Warner the best wishes of the whole Warner-American organization for success in the new and important position he is to occupy.

Progress on Yosemite Cement Company Project

MACHINERY for the construction of a million dollar cement plant in Merced county has been purchased and is on its way, according to announcement by J. E. Munroe, president of the Yosemite Cement Co. The mineral deposits are located at the mouth of Jenkins gulch on the Merced river in Mariposa county and the plant is to be located at Merced.

Contract for the construction of the plant has been awarded to the Hunt Engineering Co. of Kansas City and work will be started in the very near future, President Munroe said. Freight rates and other preliminary matters incidental to the operation of the plant have been arranged for.

Contracts for the purchase of lime have been entered into with the Agricultural Lime and Cement Co. of San Francisco, of which Mr. Munroe is also president. The cement company is said to have wealthy middle Western capitalists in its personnel who have been working quietly for several years, and who have acquired 1500 acres in the valley in addition to the Merced holdings.

Howard B. Gill Leaves the A. G. C.

FOR the past four years Howard B. Gill has been connected with the Associated Business Contractors of America, first as assistant secretary, then for three years as its publication manager. He will now become publicity and financial secretary of the National Council for Prevention of War.

This council is a federation of 36 national organizations, including the National Board of Farm Organizations, National Education Association, etc. The officers and executive board include President Lowell, of Harvard, Jane Addams, Will Irwin, William Allen White, President Hibben, of Princeton, and other publicists and leaders in national life.

Limestone Producers Hold Pennsylvania Meeting

THE annual June meeting of the National Agricultural Limestone Association, attended by 25 members from eight Eastern and Middle Western states, was held at State College, Pa.

President John M. Thomas and officials of the college school of agriculture met with the limestone men at their banquet the night before and business sessions were concluded the following day,

Visits were made to college fertilizer experiments, the oldest in the United States, and to the more recent experiment at Snow Shoe, where the college has successfully demonstrated that worn out farm lands can be revived and made to produce well.

Death of Robert W. Hunt

CAPT. ROBERT WOOLSTON HUNT, founder and president of the Robert W. Hunt Co., consulting engineers, died at his home, Chicago, Ill., July 11, at the age of 84.

Capt. Hunt was born on December 9, 1838, in Fallsington, Buck county, Pennsylvania. He came to Chicago in 1888 and established the Bureau of Inspection, Tests and Consultation, which later became Robert W. Hunt & Co. In 1912 he was awarded the John Fritz medal for his contributions to the early development of the Bessemer steel process, and last June was given the Washington award by the various societies also in recognition of his achievement.

He is survived by his widow, Mrs. Eleanor Hunt, to whom he was married in 1866.

Great Western Cement Co. to Supply Agstone to Farmers

THE brisk demand for agricultural limestone in southeastern Kansas has interested the Great Western Portland Cement Co., Mildred, Kans., the heart of the lime using district, in the installation of a lime pulverizer. If the plans under way materialize, farms with acid soils may be supplied with a high-grade product at a lower cost.

E. B. Wells, soils specialist, in discussing the use of lime in this territory as a preparatory step in the production of legumes says, "My greatest trouble at present is not in interesting farmers in the value of correcting acidity with lime, but in securing a source of good high-grade material, conveniently located and at a cheaper price."

Clinchfield to Build Cement Plant in Georgia

THE Clinchfield Portland Cement Co., Kingsport, Tenn., has acquired property near Macon, Ga., and will have plans prepared for a new plant with initial capacity of about 2000 bbl. per day. A power house and machine shop will be built. The entire works with machinery will cost about $1,000,000. John A. Miller is president, and W. M. Bennett, second vice-president and treasurer.

The capacity of their present dry-process plant at Kingsport is 4000 bbl. daily.

German Slag Cements

THE German slag-cement industry has now gained a position of equal importance with the portland-cement industry of that country, and a new slag-cement research institute has been formed and opened at Dusseldorf, according to an article in the *Journal* of the Society of Chemical Industries.

To Survey Seasonal Operation in Construction Industries

SAVINGS not only to the building industry and its workers but to the public generally are expected to result from the activities of a committee on seasonal operation in construction industries, the appointment of which by Herbert Hoover, chairman of the President's Conference on Unemployment, has just been announced by the Department of Commerce. This saving should be reflected in lower relative cost of dwellings and other buildings. The members of the committee are:

Ernest T. Trigg, manufacturer, Philadelphia, Pa., chairman; John W. Blodgett, manufacturer, Grand Rapids, Mich.; John Donlin, president, Building Trades Department, American Federation of Labor, Washington, D. C.; L. F. Eppich, president, National Association of Real Estate Boards, Denver, Colo.; A. P. Greensfelder, contractor, St. Louis, Mo.; John M. Gries, Department of Commerce, Washington, D. C.; Otto T. Mallery, public works expert, of Philadelphia, Pa.; Rudolph P. Miller, engineer, New York; James P. Noonan, president, Brotherhood of Electrical Workers, Washington, D. C.; William Stanley Parker, architect, Boston, Mass., and Edward Eyre Hunt, secretary. Mr. Trigg called a meeting of the committee for July 10 and 11 to lay out plans for a thorough study of the facts.

Previous surveys have indicated that most construction activity is concentrated in from 7 to 10 months of the year, which means that building trades workers can not find work in their trade during several months, and that contractors' organizations and equipment, architects, engineers, building material producers, and others connected with construction must usually remain idle for similar periods. This idle time represents waste and direct losses to the construction industries themselves, their workers, and the public.

The committee was formed in the hope that by examining the facts and proposed remedies it might be able to suggest sound solutions and obtain general co-operation in effecting them. It is the general impression that seasonal building has been due perhaps more to custom than to weather, and it is expected that the investigation will throw light on this and other important points.

Gravel Roads Are Leading in Mileage

THE relative mileage of the various types of road being built in this country is indicated by figures given by the Bureau of Public Roads of the United States Department of Agriculture. These figures apply only to federal-aid roads, but since they represent 25,000 miles of road now in use and include roads built in every state, they may be taken as fairly representative of the character of the main highways. The 25,000 miles is divided by types as follows:

	Pct.
Gravel	39.1
Graded and drained	20.6
Cement concrete	18.3
Sandy clay	10.8
Bituminous macadam	4.0
Bituminous concrete	3.1
Water-bound macadam	2.7
Brick	1.4

Complete figures covering all roads constructed and now in use would undoubtedly show somewhat higher percentages of the lower types of road, since the more important roads have been selected for improvement with federal aid.

Connecticut's Highway Commissioner Enters the Quarry Industry

CHARLES J. BENNETT, who resigned as State Highway Commissioner of Connecticut June 30 to become vice-president and general manager of the Edward Balf Co., is a highway engineer of international reputation. He has been state highway commissioner of Connecticut for the past ten years, and before that was city engineer of Hartford, Conn. He is a graduate of Union College, New York, and received the honorary degree of M. A. from Yale University in 1921 for his admirable public services.

Charles J. Bennett

The Edward Balf Co., of which he now has the general managership, is one of the principal quarry companies in Connecticut, with three crushing plants, at East Hartford, Newington and Tariffville. The company also has gravel pits and does a large general contracting business. When recently interviewed by the editor of Rock Products on a recent visit to Hartford, he said that he was particularly interested in the quarry operating side of his new job, and could heartily subscribe to the aims and purposes of the National Crushed Stone Association in building up a more extensive knowledge of quarry engineering.

Mr. Bennett is a member of the American Society of Civil Engineers, a past president of the American Road Builders Association, and is prominent in many organization activities.

Polish Cement Industry Working Under Capacity

THE maximum annual productive capacity of the Polish cement industry is estimated at 1,044,000 metric tons, but actual production amounts to considerably less than 50 per cent of capacity. Twelve cement-manufacturing establishments were operating during February, employing 3700 men.

Cement prices show a steady upward tendency, due mostly to increasing costs of coal, labor, and transportation. Recently cement manufacturers asked that railroad tariffs on cement consignments be reduced, basing their request on the fact that with too high railway tariffs their industry could not meet German competition in the Polish domestic markets, as German cement pays no tax on coal—*Commerce Reports.*

Manufacture of School Slates

SEVERAL million school slates are manufactured in the United States every year and about 90 per cent of them are exported, according to the Department of the Interior, which has, through the Bureau of Mines, made a complete study of the technology of slate.

Slate suitable for the manufacture of school slates is found in soft black beds free of all hard streaks or knots of flinty material. Such slate may be used also for roofing, but they commonly fade rapidly when exposed to the weather. They are split in the same manner as roofing slates, but the trimming is done with small saws that rotate at high speed. When trimmed to size, they are delivered to the school-slate factories. Here the edges are first beveled and then the slate is placed on edge between two knives and a descending bar forces it down so that the knives scrape off all rough projections. A second pair of knives gives the slate a smoother surface. The slates are then polished between sanded drums, thoroughly washed in hot water, and carried on a belt conveyor through a heated chamber to dry them before piling; they are then ready for framing. Slates broken in the framing process are unframed and recut to smaller sizes.

Quarried from Life

By Liman Sandrock

J. Morley Zander

The chap about whom we are spilling this "noise"
Is a sand-lime brick man whose avoirdupois
Gives weight to his substance. B'rer Zander enjoys
The esteem of his fellows for his equipoise
While bearing his troubles, his worries, his joys,
In leading the National's sand-lime brick boys.

IF you've been a regular attendant at the conventions of the Sand-Lime Brick Association—and you will so measure up if you are a sand-lime brick producer—you will have become convinced that it takes no lightweight to hold down the heavy job of guiding the destinies of that association. It takes a heavy mental equipment plus a weighty "container" to keep the ship from dashing upon the rocks that imperil its course.

We remember well the Dayton convention in 1922 when J. Morley Zander was lending both his weight and dignity to his job as secretary. Today, perhaps as a well-earned reward for those efforts, J. Morley is president, stepping into the shoes of his friend and associate, President Jackson. He is filling them, too.

In Rock Products for June 30 we promised to tell you something about him. Here's how!

Like all of us, he had to be born—and Chicago was the lucky cradle to receive him September 10, 1881. If we were an occult scientist we would say, even if we had never known him, that, born under the zodiacal sign Virgo, when the sun was on the edge of the cusp, he "can rebound quickly from defeat and disaster, and order and harmony are very necessary to his health." Is he healthy? Give a look at his picture! Is he in harmony with his surroundings? Well, he and his association are almost at one, aren't they? Reckon this proves our case.

When he was 10 years old his mother died and his father, a lawyer, moved to Caro, Mich., and later on to Saginaw.

Most any of us can still remember the time when we acquired the "run away from home" fever. We can. Well, at 16, J. Morley became inoculated and then picked out the North Woods lumber camps as his destination. After a year as a lumberjack he went to work for a St. Charles coal company. He did not by any means reach the coal-baron stage, but he had a hand in all its phases, going from one company to another until he had risen to the proud height of assistant superintendent.

As the wanderlust still burned in his youthful bosom, he put it to good advantage by traveling for a coal company and sold coal and coke on the road. This experience lasted for some 14 years. But coal had no such fascinations as brick, so in 1912 we find him with the Saginaw Brick Co. as a salesman. And the brick business it has been ever since. Four years later he became that company's secretary and general manager—and still is.

Mr. Zander's association with John L. Jackson, president of the company, has been very close, aside from their teamwork in the National Association. He is assistant to Mr. Jackson and general manager of all of the latter's brick plants, both in Michigan and in Indiana.

J. Morley Zander, president of the National Sand-Lime Brick Association

He is a good sportsman, too, but perhaps his greatest pleasure is in touring the Michigan roads in his Cadillac coupe—although he will admit that the lizzie is a good little bus and so is the Rolls-Royce. (We have in mind a lime producer whose missus drives the Cadillac while he moves about contentedly in his tinnous boat, oblivious of the carping critics. Probably a lime producer can afford to scorn the social conventions.)

Then, again, Mr. Zander is a Kewanis Club member. He is so kewanised that the other local kewanisers put the Indian sign on him in 1920 by making him the president of the Saginaw Kewanis Club—or is it grand sachem, for our Indian lore is only about 4-mesh?

Charley Breskin, one of our Rock Products lights, told us the other day: "Brother Zander is a darn good fellow, and it's up to you, Lyman, to tell the wide world that he is." And we hope we have.

Our British Contemporary's "Chippings"

THE cheeps and chirps from "Chippings," in the *Quarry Managers' Journal*, are after our own heart—full of kindly humor and scintillating with merriment.

The British Institution of Quarry Managers held a big convention at Llandudno, June 28-30, and visitors attended from nearly all over the well-known world—anyhow, several American brothers were there. And quarry managers were present from Penrhyndeudraeth and Minffordd and Blaenau Festiniog—my word, this meet must have happened in Wales!

So "Chippings" added to the happiness of the occasion and served up some of those little joshes to which we have referred. For instance: Pa Page has agreed to leave his cigars at home—In reply to inquiries, interpreters are not required (Welsh is hard, even on a violin)—One member writes: "I would like a bedroom to myself as I am blamed for snoring" (so they put him in a separate wing of the hotel)—Brother Davis, of the Davis Slate and Mfg. Co., writes: "'Whosoever soweth, so shall he rip,' so by trying to sow seeds of discontent with present methods I will only be helping to rip hell out of those methods." And the jolly chaps of the Institution are wishing that friend Davis would come over and join them in convention at Llandoodledud—well, wherever it was we first said it was.

It's rippin' good stuff, old dears, eh, what?

They Said It

That James E. Carroll, Samuel J. Dark, and Daniel E. Knowlton should be cleared of their alleged violation of the Anti-Trust law by the New York Supreme Court is highly gratifying to the sand and gravel industry. The daily press also expresses its approval, which it does not always do in like cases.

California opposes a state-owned cement plant. The most pertinent interrogation was fathered by the Colton *Courier* when it asked: "Whither does it lead?" You tell 'em, brother!

Dick Kolck, Jr., of the Clayton Brick and Tile Co. out in Clayton, Ioway, told us the other day that "with the help of a good horseshoe, I annexed the president's cup in our tournament. As I got the low qualifying score, too, this gave me a very fine silver pocket flask—EMPTY." (The emphasis is Dick's.)

Editorial Comment

Representation by Industries

Several times we have suggested in these columns that trade associations are coming to serve more and more as a part of our *de facto* government, although at present unrecognized officially as a part of our representative form of government. Labor *is* recognized officially by a secretary of labor and a labor party, or congressional labor "bloc"; the farmers are recognized officially by a secretary of agriculture, and an agricultural bloc. The business man, as an employer, has never received the same official recognition, and what political influence he has been able to exert has been more as an individual than as a member of a great body of citizens having common interests more or less in conflict with the other recognized, organized groups. Under Secretary of Commerce Hoover, it is true that trade associations have received much attention from the government, and he has indeed used them to standardize and codify trade practices as a semi-governmental agency.

As time goes on and our industrial system becomes more and more complex, one of two things will inevitably happen: The government will either take a constantly larger and larger part in industry; or men engaged in industry will take a greater share in government. There is a tendency to break away from old political party grouping to grouping of classes or conditions of citizens that have, or think they have, common interests to promote or preserve. This tendency should be one of the strongest inducements to business men to join trade and professional associations, where they can compare notes, discuss matters of general and national interest, and train themselves and their industrial associates to assume larger responsibilities.

We have in this country no really comprehensive national organization of employers except the Chamber of Commerce of the United States, which is not so organized that it adequately represents the various groups of industries from which its members are drawn. In Great Britain, whose form of government is more elastic than ours, they have a National Confederation of Employers Organizations, which is a sort of industrial parliament in which each industry is officially recognized and officially represented.

In order that the various elements of the quarry industry might be adequately represented in this National Confederation of Employers Organizations, the scheme of representation described elsewhere in this issue was developed. This scheme was made necessary by the insistence of the government that the quarry industry, in spite of the wide differences in producing cut-stone, slate, crushed stone, etc., should have but one national joint industrial council. This insistence eventually proved valuable to the quarry industry because it has made the industry realize its great political strength with government departments, "which now fully realize that 'quarries' are a fully organized trade, and can form and express opinions and decisions apart from 'mines,' under which classification they were formerly lost sight of."

In studying this organization—its accomplishments and its possibilities—one can not help regretting that American quarry operators, slate, granite, limestone, and all the other rock products, have not been driven into a similar grand "quarry unit," which could be so very effectively used today in meeting pressing problems of immigration policy, transportation, etc.

Experience Exchange

In the last analysis all knowledge is the result of experience. We are wiser today than the cave man because we come in an era of civilization where the experience of the human race has been noted and recorded for several thousand years. The cave man learned by *individual* experience only, or by what little of his forbears' experience he was capable of getting by word of mouth. Unfortunately for themselves and for the industry of which they form a part some manufacturers and producers today still cling largely to cave man methods of gaining business knowledge.

Industries forge ahead and become dominant only through comparison and study of *collective* experience. The industries which have made such tremendous progress in the last 100 years that they have completely revolutionized life on this earth are the engineering industries. Why? Largely because among engineers and scientific men generally a free interchange and comparison of experience is the very foundation of their knowledge.

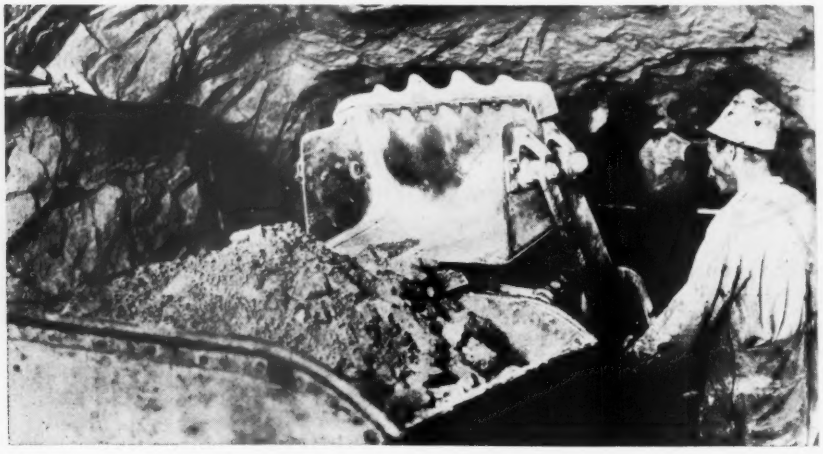
The *chief* function of a trade association is to furnish a means of such interchange. The *only* function of a reputable trade journal is to be the medium or vehicle of such interchange. There are no trade secrets in an industry which is truly progressive, for no industry can bind up within a comparatively small group all knowledge or all experience, even in regard to the simplest manufacturing process. Progress in every industry depends fully as much on recognizing and adopting knowledge outside the industry as it does on perfecting existing knowledge in the industry.

An industry which attempts to keep within itself all knowledge of the industry at the same time discourages all suggestions from the outside; and suggestions from the outside have been the salvation of many industries.

New Machinery and Equipment

Compressed-Air Shovel

THE Shuveloder shown in the illustrations has been placed on the market recently by the Lake Superior Loader Co., Duluth, Minn. As its name implies, it is a mechanical shovel which loads by shoveling, and is useful wherever broken rock is to be loaded into cars.



Delivers rock into car directly behind the machine

This machine is operated by compressed air only, power being applied through direct thrust air cylinders. It is claimed that there are no complicated parts and no small moving parts to get out of order. The manufacturer says that the machine, which is moved by hand, is easy to operate, the movements being controlled by three hand levers and one hand crank for swinging across the drift—all located on the side of the machine. It is also said that only one operator is required to run the Shuveloder, the number of additional men being determined by the size of cars and the length of tram, and that inexperienced workmen have no difficulty in learning to operate the machine.

The machine is equipped with three control valve levers operated one after another to crowd, dig, and dump the dipper. Concentric tracks have center 2½ ft. back of machines, and it is claimed that the dipper dumps into center of car from any position, either extreme right or left side. The two middle cylinders (acting as one) which do the main digging are provided with cataract oil escapement plunger pistons. This arrangement, it is claimed, gives the digging motion a steady, controlled movement with no building up of pressure and consequent jumping, or throwing out of the load, without which, the manufacturer says, the Shuveloder would not be practical. One of the illustrations gives a composite picture of the machine showing the path of the dipper through the crowding, digging, and dumping motions. It is claimed that the entire movement is fast but smooth and steady, the speed at the moment of dumping being fast to throw the material into a long car, or slow to drop it into a short one.

Self-Feeding Mounted Truck Loader

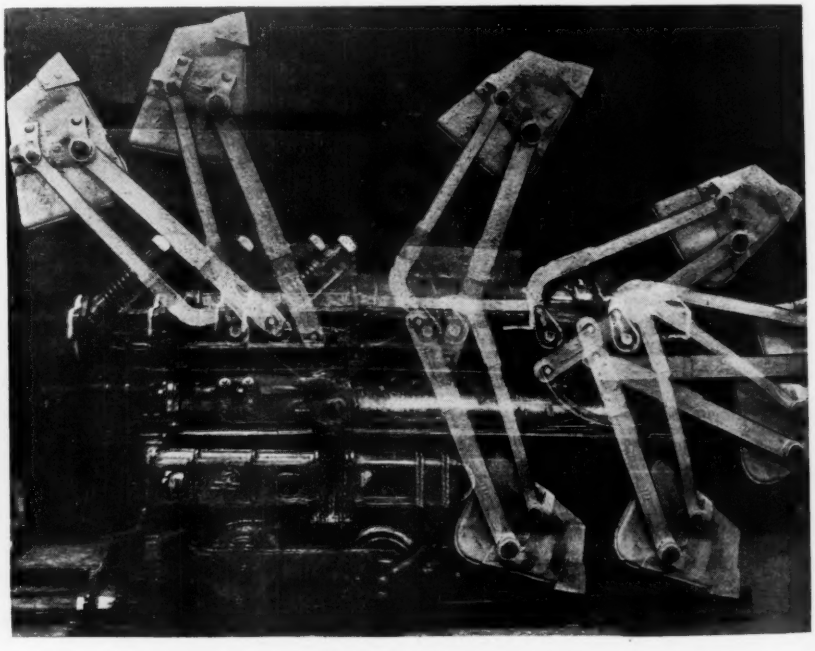
A NEW product of the N. P. Nelson Iron Works, Inc., Brooklyn, N. Y., is a self-feeding bucket loader mounted on a standard Fordson tractor. Two novel features of this machine show a notable development of practical advantage, states the company.

Instead of crawling under the elevator, where he cannot see what he is doing or digging, surrounded by chains and sprockets, the operator stands on a platform at the side of the machine, with all controls within easy reach and with a clear view of the entire digging and loading operation.

The second point, the company says, is that by connecting the elevator direct to the engine instead of to the usual power takeoff, the elevator with its powerful toothed digging spirals runs full speed, while the tractor may be inched backward into the disappearing pile.

The spirals level a 6-ft. cut, and material once started in motion keeps moving continuously until picked up by the elevator bucket, it is said. An overload release gives the operator ample warning of boulders or undiggable material.

The capacity of the machine is claimed to be 40-yd. per hour of 2-in. material, and under that a man can shovel without



Composite picture showing path of the dipper through the crowding, digging, and dumping motions

the use of a pick. A governor controls the fuel consumption to the actual requirements. The power takeoff remains available should the owner require its use for operating other machinery, while the entire loader attachment can be readily removed and the tractor used for other purposes.

Self-feeding truck loader mounted on a Fordson tractor

A swivel spout is attached to the loader, permitting discharge sidewise into the truck if necessary. The elevator frame is of truss design; the buckets, chains, sprockets, etc., are in keeping with the regular design of the maker. Those who own tractors can have the loaders mounted on them by the manufacturer.

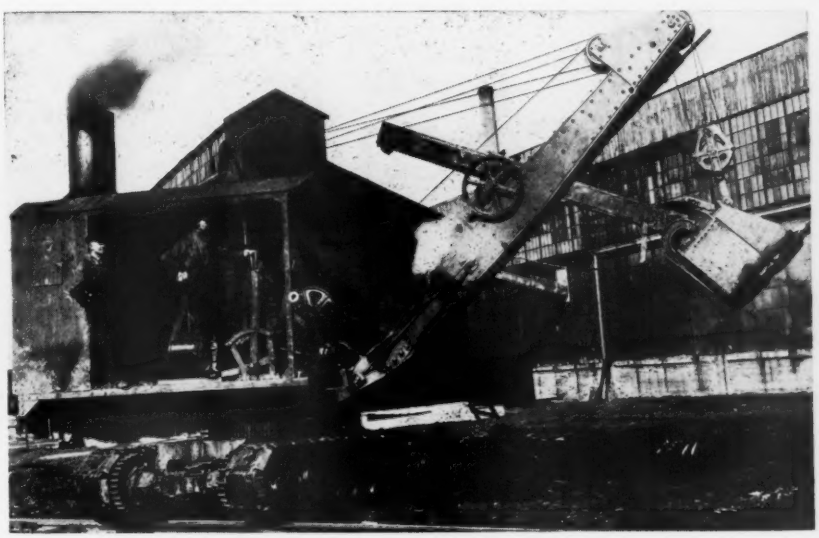
A New 10-Ton Steam Operated Convertible Crane

THE McMyler-Interstate Co., Cleveland, Ohio, announces that it has recently placed on the market a new steam operated convertible crawler crane adaptable to sand and gravel operations and construction work.

It is claimed that this No. 2 Crawler crane is available for each new job as rapidly as the buckets can be changed and that it is built for all-round work. The construction is sturdy and generous in every detail—built like a locomotive crane, says the company. Furthermore, the travel base and the turntable are heavy box-section steel castings; all the gears are above the turntable and are cut of steel; the rollers and shafts are one-piece hardened steel forgings; all bearings have large, renewable bronze bushings; the frictions are oversize to assure flexibility of control and long-wearing qualities.

In designing this crane, say the engineers, full appreciation has been given to the desirability of having all parts readily accessible for adjustments and repairs; the parts may be taken down by removing a set of bearing caps; the few adjustments are within easy reach of the operator.

The crawlers are said to embody features which will give a uniform drive over the entire face of the treads, giving stability while traveling and eliminating the possibility of tooth breakage or of the treads jumping the sprocket wheels. The treads form a continuous steel track for the eight hardened steel rollers. An adjustible screw is provided to take up any slack which may develop. All steering is done by the operator from his cab, and by throwing a hand lever and swinging the crane in the desired direction the machine is easily steered about curves and sharp corners. The crane may be pivoted on one crawler. Of special importance, says the company, is the fact that the crane may be steered in any direction irrespective of the relative position of the cab and the running gear. The company also claims that in addition to handling bucket and line work, this crane may be readily converted in the field of a ¾-yd. steam shovel; an attachment for driving piles is also available. The crane may also be mounted on traction wheels or on a standard-gage railroad car body.



Steam-operated convertible crawler crane

Uses for Limestone Screenings

LIMESTONE crushed to the consistency of sand grains may be used as a substitute for sand in mortar and wall plaster, according to the Department of the Interior, which has, through the medium of the Bureau of Mines, conducted a general study of the utilization of waste rock at lime plants.

The superiority of crushed limestone over clean sharp silica sand is doubtful, but in regions where natural sand is scarce the substitution of a limestone product may be justified. Limestone screenings are used with success as fine aggregate in concrete for various purposes. Concrete brick, both common and face brick, are manufactured with limestone screenings as aggregate and are said to give satisfactory service in house construction.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Pennsylvania	1.35	1.35	1.45	1.35	1.35	1.35
Munns, N. Y.	1.00	1.40	1.40	1.30	1.30	.....
Prospect, N. Y.	.80	1.40	1.40	1.30	1.30	.....
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.50	.....	1.50	1.35	.....	.....
Buffalo, Iowa	.70	.....	1.35	1.15	1.20	1.20
Bloomville, Middlepoint, Dunkirk, Bellevue, Ohio	1.00	1.10	1.10	1.00	1.00	1.00
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	.80	1.50	1.10	1.10	1.10	1.10
Dundas, Ont.	.95	1.35	1.35	1.35	1.10	1.10
Greencastle, Ind.	1.25	1.15	1.05	1.05	.95	.95
Krause, Columbia and Valmeyer, Ill.	1.20	1.20	1.35	1.35	1.20	1.20
Lannon, Wis.	.80	1.10	1.10	1.00	1.00	.90
Mitchell, Ind.	1.00	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.90	1.20	1.10	1.00	.95	.95
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10	1.05@1.10
Southern Illinois	1.35	1.30	1.30	1.30	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Ia.	.75	.....	1.50	1.40	1.30	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.00	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.	1.00	1.00	1.00	1.00	1.00	1.00
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bridgeport, Texas	1.10	1.40	1.35	1.35	1.25	1.25
Bromide, Okla.	.75	2.00	1.75	1.60	1.50	1.25
Cartersville, Ga.	1.25	1.75	1.75	1.15	1.15	1.15
Chickamauga, Tenn.	1.00	1.00@1.25	.....	1.00@1.25	.90@1.25	.....
El Paso, Texas	1.00	1.00	1.00	1.00	.....	.....
Ft. Springs, W. Va.	.80	1.50	1.50	1.40	1.40	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas), Tex.	1.25	1.25	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.90	1.90	1.80	1.80	1.80
Blue Spr'gs and Wymore, Neb.	.20	1.50	1.50	1.40	1.30	1.25
Cape Girardeau, Mo.	1.35	.....	1.10	1.35	1.10	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.35	1.15	1.00	.....
Bound Brook, N. J.	1.70	2.10	1.80	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	1.00	2.25	2.00	1.50	1.40	.....
E. Summit, N. J.	1.80	2.30	1.90	1.60	1.40	.....
Eastern Massachusetts	.85	1.75	1.75	1.40	1.40	1.40
Eastern New York	.75	1.50	1.50	1.30	1.40	1.30
Eastern Pennsylvania	1.25	1.55	1.50	1.40	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50@2.00	1.35@1.50	1.15@1.25	1.00@1.10	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Richmond, Calif.	.50•	.....	1.50•	1.50•	1.50•	.....
San Diego, Calif.	1.80	1.80	1.50@1.80	1.25@1.55	1.25@1.55	1.10@1.35
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	1.80	2.00	2.00	1.70	1.60	1.60
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Atlanta, Ga.—Granite	1.47	2.07	2.07	1.97	1.97	.....
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	2.25	2.25	2.00	2.00	2.00
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.60	1.55	1.35	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.35	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	.75	1.75	1.75	1.40	1.40	1.25
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@1.50
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

•Cubic yard. †Agrl. lime. ||R.R. ballast. ‡Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone

(Pulverized)

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; 100% thru 20 mesh; sacks, 5.00 ..... 3.50

Hillsville, Pa.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; sacks, 5.00; bulk 3.50

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk 2.50

New Castle, Pa.—96% $CaCO_3$ 1.40% $MgCO_3$—75% thru 100 mesh, 94% thru 50 mesh; sacks, 5.00; bulk 3.50

Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk 3.00

Watertown, N. Y. — Analysis, 96% $CaCO_3$; 02% $MgCO_3$; 90% thru 100 mesh; bulk, 3.00; sacks 4.50

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$ — 50% thru 100 mesh; paper bags, 4.75—cloth, 5.25; bulk 3.25

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.5% $MgCO_3$; 90% thru 100 mesh 6.00

Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh.. 5.00
90% thru 50 mesh 1.35

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh ..... 1.80@3.80

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 90% thru 50 mesh; 80-lb. paper sacks 5.00
Bulk 3.50

Piqua, Ohio—100% thru 10 mesh, 2.10; 50% thru 100 mesh, 2.25; 80% thru 100 mesh, 5.00; 100% thru 100 mesh, bulk 5.50; bags 7.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 50% thru 100 mesh 1.50

Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk 2.70

Knoxville, Tenn.—80% thru 100 mesh, bulk 2.70
(Bags 1.25 extra)

Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk 2.75

Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks 5.00

Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk 4.00

Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk 4.50

Agricultural Limestone

(Crushed)

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh 1.50

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh 1.25

Bettendorf, Iowa, and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh 1.50

Buffalo, Iowa—90% thru 4 mesh 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 100% thru 10 mesh, 90% thru 50 mesh 1.50
90% thru 4 mesh, cu. yd 1.35

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh .... .80

Columbia, Ill., near East St. Louis—½-in. down ..... 1.25@ 1.80

Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$; 50% thru 50 mesh 1.25

Huntington and Bluffton, Ind.—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh 1.25

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Agricultural Limestone

(Continued from preceding page)

Greencastle, Indiana.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh	1.20
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 32% thru 50 mesh; 51% thru 50 mesh; 100% thru 4 mesh; 83% thru 10 mesh; bulk	1.25
Milltown, Indiana.—Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh	1.25@ 1.65
Mitchell, Ind.—Analysis, 97% $CaCO_3$, 1% $MgCO_3$; 50% thru 100 mesh, 90% thru 4 mesh	1.25
Montrose, Iowa.—90% thru 100 mesh	1.25
Narlo, Ohio.—Analysis, 56% $CaCO_3$, 43% $MgCO_3$; limestone screenings, 37% thru 100 mesh, 55% thru 50 mesh, 100% thru 4 mesh	1.50@ 2.00
Ohio (different points), 20% thru 100 mesh, bulk	1.25@ 1.50
Piqua, Ohio—100% thru 4 mesh	1.25
River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ⅛-in. mesh	1.30
Stone City, Iowa. — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Toledo, Ohio.—¼ in. to dust, 30% thru 100 mesh	1.50
Waukesha, Wis.—No. 1 kiln dried	2.00
No. 2 Natural	1.75
Alderson, W. Va. — Analysis, 90½ $CaCO_3$; 90% thru 50 mesh	1.75
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 90% thru 50 mesh	1.50
Cartersville, Georgia.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—all passing 10 mesh	1.75
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh	3.00
50% thru 50 mesh, 90% thru 4 mesh, 50% thru 4 mesh	2.75
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Ladds, Ga.—50% thru 50 mesh	2.00
Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCO_3$; 50% thru 50 mesh	.50
Kansas City, Mo., Corrigan Siding—50% thru 100 mesh; bulk	1.80
Tulsa, Okla.—90% thru 4 mesh	.50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

Glass Sand:	
Berkeley Springs, W. Va.	2.25@ 2.50
Cedarville and South Vineland, N. J.—Damp, 1.75; dry	2.25
Cheshire, Mass.	7.50@ 8.00
Columbus, Ohio	1.50@ 2.00
Dunbar, Pa.—Damp	2.50
Falls Creek, Pa.	2.25
Hancock, Md.—Damp, 1.50; dry	2.00
Klondike and Pacific, Mo.	2.00@ 2.50
Mapleton, Pa.	2.25@ 2.50
Mapleton Depot, Pa.—Damp, 2.00 dry	2.75
Massillon, Ohio	3.00
Michigan City, Ind.	.50
Millville, N. J. (green)	2.00
Mineral Ridge, Ohio	3.00
Montoursville, Pa.	2.00
Oregon, Ill.	2.50
Ottawa, Ill.	1.50
Pittsburgh, Pa.—Dry, 4.00; damp	3.00
Rockwood, Mich.	2.50@ 2.75
Round Top, Md.	2.25
Sands, Pa.	2.50
San Francisco, Calif.	3.00@ 3.50
St. Louis, Mo.	2.50@ 3.00
Thayers, Pa.	2.00@ 2.50
Utica, Ill.	1.40@ 1.75
Zanesville, Ohio	2.00@ 2.50
Foundry Sand:	
Albany, N. Y.—Molding fine	2.25
Molding coarse	2.00
Sand blast (kiln dried)	4.50
Brass molding	2.25
Allentown, Pa.—Core and molding fine	1.75@ 2.00
Arenzville, Ill.—Molding fine	1.50@ 1.75
Brass molding	1.75@ 2.00
Beach City, Ohio.—Core, washed and screened	2.00@ 2.50
Furnace lining	2.50@ 3.00
Molding fine and coarse	2.25@ 2.50
Cheshire, Mass.—Furnace lining, molding fine and coarse	5.00
Sand blast	5.00@ 8.00
Stone sawing	6.00
Cleveland, Ohio.—Molding coarse	1.50@ 2.00
Brass molding	1.50@ 2.00
Molding fine	1.50@ 2.25
Core	1.25@ 1.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f.o.b., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.75	.75	.75
Ambridge and So. Heights, Pa.	1.25	1.25	1.25	.85	.85	.85
Buffalo, N. Y.	1.10	.95			.85	
Erie, Pa.	.75		.90		1.10	
Farmingdale, N. J.	.48	.48	.75		1.10	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75		1.35	1.25
Machias, N. Y.	.75	.75	.85	.85	.85	.85
Pittsburgh, Pa.	1.25	1.25	1.25	.85	.85	.85
Portland, Me.		.50	1.75		1.35	1.35
Washington, D. C. (Rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.	.60	.60	.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.25	1.60	1.60	1.60
			Unwashed ballast, .50 ton			
Dresden, Ohio	.70	.60	.60		.90	
Earlestead (Flint), Mich.	.70					
Eau Claire, Wis.	.40	.40	1.00@1.25		.85@ .90	
Elkhart Lake, Wis.	.70	.60	.76	.80	.70	.70
Ft. Dodge, Iowa		1.22		2.17		
Grand Rapids, Mich.		.50		.80	.70	
Hamilton, Ohio	1.00	1.00	1.00		1.00	
Hawarden, Iowa	.60	.50			1.60	
Hersey, Mich.	.50	.50	.60		.80	.75
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Iowa	.70	.65	1.70	1.65	1.65	1.65
Mankato, Minn. (pit run)	.50	.50	.60	1.35		1.35
Milwaukee, Wis.	1.11	1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	.60@ .80	.60@ .80	1.20@1.50	1.20@1.50	1.20@1.50	1.20@1.50
Riton, Wis.		.40			.60	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.45
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.90	.90	.90
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.10	1.10	
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	1.24	1.24	2.79	1.90	1.90	1.90
Birmingham, Ala.	1.29	1.29	2.79	1.79	1.64	1.54
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.35		1.00	.85	.65
Ft. Worth, Texas		1.50	1.50	1.50	1.50	1.50
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	.75@1.00	1.20	1.20	1.20	1.20
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va.	1.00	1.00		1.20	1.00	.80
New Orleans, La.	.25			.85		
Roseland, La.				.85	.85	
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.			(Kaw river sand, car lots, .75 per ton; Missouri river, .85)			
Los Angeles, Calif.		.70	1.20	1.20	1.10	1.10
Pueblo, Colo.	1.10*	.90*		1.50*		
San Diego, Calif.†	.50@ .70	.80@1.00	1.30@1.60	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.25*	1.25*	1.50*	1.25*		1.25*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point	Fine sand, 1/10 in.	Sand, ¼ in.	Gravel, ½ in.	Gravel, 1 in.	Gravel, 1½ in.	Gravel, 2 in.
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, .80 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dresden, Ohio		.60				
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.60			.55@ .60	
Grand Rapids, Mich.						.50
Hamilton, Ohio					.70	
Hartford, Conn.		1.00*				
Hersey, Mich.				.55		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas			.55	.55	.55	
Janesville, Wis.		.65			.65@ .75	
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.	.25					
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			Bank run gravel 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.	.40	.40	.60	.60		
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. || Ballast. † Low prices, wholesale; high prices, retail.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.05
Eastern Penn. and Northern N. J.	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.50	.80	1.25	.90	.90	.80	.80
Erie, Pa.		Crushed run slag, 4 in. and less, 1.25@1.35					
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Penn.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, f.o.b. Chicago				
Detroit, Mich.			All sizes, 1.65, f.o.b. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Jackson, O.		1.35		1.35	1.35	1.35	1.35
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
Steubenville, Lowellville, Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Alabama City, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton and Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.				12.50				
Berkeley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00@10.00					
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		11.50	11.50	12.50				1.85
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio		11.00	11.00				10.00	
Delaware, Ohio	12.50	11.00	10.00	12.00			10.00	1.60
Gibsonburg, Ohio	12.50	11.00	11.00		9.00	11.00	10.00	
Huntington, Ind.		11.00						1.60
Luckey, Ohio	12.50a	11.00	10.00a		9.00			
Marblehead, Ohio		11.00	10.00				10.00	1.60
Marion, Ohio		11.00	10.00				10.00	
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.							10.00	
White Rock, Ohio	12.50				9.00	11.00		
Woodville, O. (dlrs.' price)	12.50a	11.00a	10.00a		9.00		10.00	1.60
SOUTHERN:								
Erin, Tenn.							9.00	1.50
El Paso, Texas							9.00	1.50
Karo, Va.							7.00	
Knoxville, Tenn.	12.50	11.00	11.00	11.00	9.00		9.00	1.50
Ocala and Zuber, Fla.	14.00	14.00		14.00				1.75
Sherwood, Tenn.	12.50	11.00	11.00	11.00			8.50	1.50
Staunton, Va.					4.50	5.50	8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	21.50	21.50	15.00	21.50			18.50	2.40
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §paper sacks. (a) 50-lb. paper bags; terms, 30 days net, 25c per ton or 5c per barrel discount for cash in 10 days from date of invoice; (b) burlap bags; (c) 200-lb. barrels; (d) 280-lb. barrels net.

Miscellaneous Sands

(Continued from preceding page)

Columbus, Ohio.—Core	.50@	2.00
Sand blast	4.50@	5.50
Molding fine	**2.75@**	**3.00**
Molding coarse	2.00@	2.50
Brass molding		2.50
Furnace lining		2.00
Molding coarse	1.75@	2.00
Stone sawing		1.50
Traction	.70@	1.00
Delaware, N. J.—Molding fine		2.00
Molding coarse		1.90
Brass molding		2.15
Dunbar, Pa.—Traction, damp		2.50
Dundee, Ohio.—Glass, core, sand blast traction		2.50
Molding fine, brass molding (plus 75c for winter loading)		2.00
Molding coarse (plus 75c for winter loading)		1.75
Eau Claire, Wis.—Core	1.00@	1.25
Sand blast	3.25@	3.75
Falls Creek, Pa.—Molding, fine and coarse		1.75
Sand blast		2.00
Traction		1.75
Franklin, Pa.—Core		2.00
Furnace lining		2.50
Molding fine and coarse		2.00
Brass molding		2.00
Greenville, Ill.—Molding coarse	1.30@	1.50
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled		.80
Bank run		.65
Kansas City, Mo.—Missouri river core		.80
Kasota, Minn.—Molding fine	1.60@	1.85
Molding coarse, stone sawing	1.45@	1.75
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse, stone sawing		2.00
Mapleton Depot, Pa.—Traction		2.00
Molding fine, damp		2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp, 2.00; dry		2.75
Massillon, Ohio—Molding fine and coarse, furnace lining, core		3.00
Traction		2.75
Michigan City, Ind.—Core, traction		.50
Mineral Ridge, Ohio.—Core (green)		2.25
Furnace lining, molding fine and coarse; roofing sand, sand blast, stone sawing, traction brass molding (green)		2.00
Montoursville, Pa.—Core	1.35@	1.40
Traction	1.00@	1.10
Brass molding		1.25
New Lexington, Ohio—Molding fine		2.25
Molding coarse		2.00
Oregon, Ill.—Core	1.50@	2.00
Sand blast		4.00
Stone sawing	2.00@	2.50
Ottawa, Ill.—Core	1.50@	2.00
Furnace lining and traction		1.50
Roofing sand		1.75
Sand blast		4.50
Stone sawing		3.00
Brass molding		2.50
Molding, coarse (crude)	.75@	1.00
Ottawa, Minn.—All crude silica sand	**.75@**	**1.00**

Miscellaneous Sands

(Continued)

Rockwood, Mich.—Core	1.90@	2.50
Roofing		2.75
Sand blast		3.75
Round Top, Md.—Core (damp)		1.60
Traction (damp)		1.75
Roofing sand		2.25
San Francisco, Calif. (washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@	3.50
(Direct from pit)		
Furnace lining, molding coarse, sand blast		3.60
Stone sawing, traction		2.30
St. Louis, Mo.—Red heavy molding	1.50@	2.25
Red fine	1.50@	2.00
Molding fine and brass	2.00@	3.00
Skein core	1.75@	2.25
White core sand	1.00@	1.75
Sand blast	2.00@	4.50
Furnace lining	1.50@	2.50
Sand blast	2.00@	4.50
Roofing sand	1.00@	1.50
Stone sawing	1.25@	2.00
Thayers, Pa.—Core		2.00
Furnace lining, molding fine and coarse		1.25
Traction		2.25
Utica, Ill.—Core, furnace lining, molding fine and coarse, brass molding	.85@	1.50
Roofing sand and stone sawing	1.40@	2.50
Sand blast		2.50
Traction		1.40
Warwick, Ohio.—Furnace lining, dry 2.75, green		2.00
Molding fine and coarse, dry 2.75, green		1.75
Traction and brass molding		2.50
Zanesville, Ohio.—Molding fine, brass molding	1.75@	2.00
Molding coarse	1.50@	1.75

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Asheville, N. C.—Best white and 200-mesh (per ton)		8.00
Yellow (per ton)		9.00
Red (per ton)		13.00
Baltimore, Md.—Crude talc (mine run)		3.50
Ground talc (20-50 mesh), bags		10.00
Ground talc (150-200 mesh), bags		12.00
Cubes		60.00
Blanks (per lb.)		.08
Chatsworth, Ga.—Grinding		7.00
Ground talc (150-200 mesh); bags	15.00@	20.00
Pencils and steel workers' crayons (gross)	1.50@	2.50
Chester, Vt.—Ground talc (150-200 mesh), bulk	6.50@	8.50
(Bags 1.00 extra)		
Emeryville, N. Y.—325 mesh (double air floated), bags		14.75
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags		18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	2.75@	3.50
(150-200 mesh), bags	9.75@	12.50
Los Angeles, Calif.—Crude talc f.o.b. Silver Lake	7.00@	12.00
Ground talc (150-200 mesh), 100-200 lb. bags)	12.00@	14.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags		6.00
(150-200 mesh); bulk, 7.00; bags		8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@	13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@	10.00
(Bags extra)		
Ground talc (150-200 mesh), bulk	10.00@	22.00
(Bags extra)		
Vermont—Ground talc (20-50 mesh); bags	7.50@	10.00
Ground talc (150-200 mesh); bags	8.50@	15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk		5.00
(Bags 1.00 extra)		
Ground talc (150-200 mesh), bulk	8.00@	14.00
(Bags 1.00 extra)		
Pencils and steel workers' crayons, per gross	1.20@	2.00

Rock Phosphate

(Raw Rock)

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 65%	6.00@	8.50
B.P.L. 65%		6.00
Gordonsburg, Tenn.—B.P.L. 68-72%	5.50@	6.50
Mt. Pleasant, Tenn.—Analysis, .65-.70% B.P.L. (2000 lb.)		6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70%		3.50

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
21x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7.80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

(Ground Rock)

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. ton	
Barton, Fla.—Analysis, 50-65% B.P.L.	3.50@ 8.00
Centerville, Tenn.—B.P.L., 60-65%	6.50
B.P.L. 75% (brown rock)	12.00
Benotis, Fla.—Analysis 77-82% B.P.L.	8.00
Montpelier, Idaho. — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	6.50@ 7.00
Twomey, Tenn.—B.P.L. 65%	6.50

Florida Soft Phosphate

(Raw Land Pebble)

	Per Ton
Benotis, Fla.—Analysis 26-28% phosphoric acid—200 lb. sacks, carload lots	10.00
Jacksonville (Fla.) District	10.00@12.00

(Ground Land Pebble)

	Per Ton
Jacksonville, Fla., District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65% B.P.L.	5.95

Fluorspar

Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	22.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines	23.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	16.00@20.00	16.00@20.00
Slate granules		6.50@ 7.00
Granville, N. Y.—Red slate granules		7.50
Harrisonburg, Va.—Blk. marble (crushed, in bags)		12.50
Ingomar, Ohio (in bags)	6.00@14.00	10.00@25.00
Milwaukee, Wis.		16.00@30.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsburg, N. J.	16.00@20.00	14.50@18.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.— (2000 lb.)		6.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 12½c extra	4.50	4.50

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@35.00
Carpenterville, N. J.	18.50	31.50@41.50
Easton, Pa.	16.00	40.00@60.00
Ensley, Ala.	16.00	76.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	22.00	32.00
Houston, Tex.		19.50
Omaha, Neb.	18.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	45.00@55.00
Puyallup, Wash.	20.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@45.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	14.00@15.00	26.00@65.00
Watertown, N. Y.	21.00@22.50	35.00@37.50
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	11.00
Boston, Mass.	15.00@16.50
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	14.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Rives Junction, Mich.	12.00
Saginaw, Mich.	12.00
San Antonio, Texas	13.00
San Antonio, Texas (deliv. city lts.)	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	20.00
F.o.b. cars	16.00
Washington, D. C.	14.50

Gray Clinker Brick

El Paso, Texas	13.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	23.50	15.00
Baltimore, Md.	24.25	17.25
Cincinnati, Ohio	16.80	14.30
Chicago, Ill.	20.00	20.00
Dallas, Tex.	22.00	22.00
Denver, Colo.	24.00	.....
Detroit, Mich.	21.00	20.00
Kansas City, Mo.	28.00	24.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New York, N. Y.	18.20	13.10
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

Portland Cement

Prices per bbl. and per bag net in carload lots

	Per Bag	Per Bbl.
Atlanta, Ga.	.....	2.85
Boston, Mass.	.....	2.68
Buffalo, N. Y.	.....	2.53
Cedar Rapids, Iowa	.62	2.48
Cincinnati, Ohio	.63½	2.54
Cleveland, Ohio	.61½	2.46
Chicago, Ill.	.55	2.20
Columbus, Ohio	.....	2.49
Dallas, Texas	.55	2.20†
Davenport, Iowa	.60¾	2.43
Dayton, Ohio	.....	2.48
Denver, Colo.	.....	2.65
Detroit, Mich.	.62	2.48
Duluth, Minn.	.56¼	2.14
Indianapolis, Ind.	.60¾	2.41
Kansas City, Mo.	.....	2.45
Los Angeles, Cal. (less 5c dis.)	.....	3.26
Memphis, Tenn.	.....	2.84
Milwaukee, Wis.	.59¼	2.37
Minneapolis, Minn.	.62½	2.39
Montreal, Canada (sks. 20c ext.)	.....	2.40
New Orleans, La.	.....	2.83
New York, N. Y.	.....	2.40‡
Philadelphia, Pa.	.....	2.56
Phoenix, Ariz.	.....	3.70
Pittsburgh, Pa.	.56	2.35
Portland, Ore.	.....	3.05
San Francisco, Cal.	.....	2.63*
St. Louis, Mo.	.58¾	2.35
St. Paul, Minn.	.62½	2.39
Seattle, Wash. (10c bbl. dis.)	.....	2.90
Spokane, Wash.	.....	.....
Toledo, Ohio	.62	2.48

†Sack 10c ext.: 10c dis. 10 days.
‡Alongside dock, 2.30.
*Warehouse, 3.15.

Mill prices f. o. b. in Carload Lots to Contractors
NOTE—Add 40c per bbl. for bags.

	Per Bag	Per Bbl.
Buffington, Ind.	.48¾	1.95
Cincinnati, Ohio	.....	3.00†
Concrete, Wash.	.....	2.60
Dallas, Texas	.....	2.15
Dayton, Ohio	.....	2.85†
Hannibal, Mo.	.....	2.10
Hudson, N. Y.	.....	2.20
Indianapolis, Ind.	.....	2.96†
Leeds, Ala.	.....	2.20
Los Angeles, Calif.	.....	2.80
Louisville, Ky.	.....	2.92†
Memphis, Tenn.	.....	3.24†
Northampton, Pa.	.....	2.10
Steelton, Minn.	.51½	1.95
Universal, Pa.	.50	2.00

†Including cloth sacks.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	—Plaster Board— ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Wallboard. ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	11.00	11.50	.....	.....	33.75	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	16.40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Bags, 10c each; Paper Bags, $1.50 per ton extra (not returnable).
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton

News of All the Industry

Incorporations

The Scobee Limestone Co., Clark, Ky., has been incorporated for $20,000 by R. P. Scobee, J. C. Scobee and J. F. Winn, all of Winchester.

The New Jersey Limestone Corp., Mansfield street, Belvidere, N. Y., has been incorporated for $200,000.

The Pratt Rock and Gravel Co., San Francisco, Calif., has been incorporated for $400,000.

The American Hydrated Lime Co., Cleveland, Ohio, has been incorporated for $100,000 by H. Schmitt, F. Burstrom, M. L. Locher, C. Carroll and F. J. Lausche.

The West Coast Rock Co., Los Angeles, Calif., has been incorporated for $150,000.

The Carter-Granite Quarries, Inc., Hardwick, Vt., has been incorporated for $200,000 by E. C. Farrington, E. P. Carter, Barre, Vt.; W. J. Steele, J. C. McConnell, Boston, Mass.

The Pacific states Stone Co., Grant Pass, Ore., has been incorporated for $45,000 by H. E. Murphy, Helen Murphy, L. Nesler and Margaret Nesler.

The Basalt Rock Co., Napa, Calif., has been incorporated for $75,000; shares, 75,000 at $100 each; subscribed, $350.

The Texas Gravel Co., Waco, Tex., has been incorporated for $25,000 by T. J. Palm, L. D. Eastland and W. D. Eastland.

The Rule Minng Co., Madison, Wis., has been incorporated for $100,000 by C. W. Singer, Dodgeville; J. M. Hayden and R. E. Pedder, Madison.

The Lawrence Stone and Gravel Co., Raleigh, N. C., has been incorporated for $1,000,000 by S. Lawrence and T. P. Cowper, Raleigh; W. R. Bonsal, Charleston.

The Peerless Brick and Sand Co., Dover, Del., has been incorporated for $500,000 by M. W. Cole.

The Wentworth Quarries, Ltd., Hamilton, Ont., has been incorporated for $200,000.

The Crushed Stone, Ltd., Kirkfield, Ont., has been incorporated for $40,000.

The Scotstown Granite Co., Ltd., Scotstown, Que., has been incorporated for $250,000.

The Durham Stone and Sand Co., Ltd., Toronto, Ont., has been incorporated for $500,000.

The Burnt River Quarries, Ltd., Toronto, Ont., has been incorporated for $100,000.

The Feldspar and Granite, Ltd., Toronto, Ont., has been incorporated for $500,000.

The Unie Cement Co., Ltd., Montreal, Que., has been incorporated for $1,000,000.

The Mountain Stone Co., Ltd., Fort Williams, Ont., has been incorporated for $200,000 by A. J. McComber, J. L. McComber, G. J. McComber, and others, of Port Arthur, Ont.

The Ontario Sand Co., Toronto, Ont., has been incorporated for $100,000.

The Northwestern Pike Lime Co., Tunnelton, W. Va., has been incorporated for $5000 by M. M. Bolyard, Newburg, H. Bolyard, J. W. Bolyard, D. Alford and J. W. Shaffer, Tunnelton.

The Huntsville Stone and Crusher Co., Huntsville, Texas, has been incorporated for $50,000 by D. M. Picon, A. N. Peckham and A. F. Paul.

Cement

The Monolith Portland Cement Co., Los Angeles, Calif., has established several new dealers for Monolith Portland cement and Monolith Plastic Waterproof Portland cement, in central and northern California, reports C. A. Lowe, sales manager of the company.

The San Joaquin Portland Cement Co., developing the "Marble Mountain" cement deposit at Three Rivers, Calif., is having 10 miles of railroad built, from Three Rivers to Lemon Cove. A plant will be erected six miles northeast of Exeter for the company. John F. Humburg heads the San Joaquin company.

The Beaver Portland Cement Co., Gold Hill, Ore., has opened up a new quarry at Marble Mountain, Ore., and a railroad is being laid by the California & Oregon Coast railway. Thousands of tons of 98 per cent pure calcium carbonate are in sight at the top of the mountain. The huge marble cliffs overhang the railroad and will provide sufficient marble to keep the plant operating for years, is the belief of the officials, who authorized the expenditure of the money for construction of the railroad through some extremely rough country. The work was started last November and is just now being completed.

The South Western Portland Cement Co., Two Republics Bldg., El Paso, Texas, will take bids early in the fall for its plant on site recently acquired near Fort Worth, Tex. A power house and machine shop will be built. The works will cost approximately $500,000 with machinery. O. J. Binford, secretary and general manager, is company engineer.

The Atlas Portland Cement Co., 25 Broadway, New York, has organized a subsidiary company, the Atlas Portland Cement Co. of Kansas, to take over the plant of the Western States Portland Cement Co., Independence, Kan. Extensions and improvements will be made. Additional equipment will be installed.

Lime

The Cornwell Lime Marl Co., near Winchester, W. Va., has closed a contract for 145 carloads of lime marl to be distributed over four counties in Pennsylvania, for fertilizer. The company also has a contract for 150 carloads to be used by West Virginia and Maryland farmers.

C. D. Hixson and John King are building a draw kiln at their limestone quarries at Owensdale, Pa., to produce agricultural lime. A crusher to pulverize burned lime will also be installed.

The Climax Lime and Stone Co., Wick Station, Butler county, Pa., has had R. R. Smith, Grove City, appointed as the receiver, for the purpose of selling the assets, paying off its obligations and closing up the business.

The Blue Diamond Materials Co., Los Angeles, Calif., has purchased a tract of seven acres adjoining its property, for $400,000, containing a stratum of fine sand.

The Blue Bonnet Lime Co.'s first unit has started quantity production at its new plant at Ft. Worth, Texas. Initial production of the plant will be 150 bbl. a day, to be doubled with the completion of the second unit. A dehydrating plant with a daily capacity of 50 tons, a warehouse, an office and a bunkhouse have been erected on the company's lot at the John T. McLendon ranch on Mary's Creek in addition to the lime plant. Executives are G. W. Harding, A. D. Thompson and D. Thompson. The company is incorporated for $50,000. This is the first plant of this nature in the territory surrounding Ft. Worth.

Sand and Gravel

The McGrath Sand and Gravel Co. gravel washing plant in East Peoria, Ill., was destroyed, when the derricks, hoppers and sieves of the plant were completely ruined by fire. It is thought the fire was caused by sparks flying from chimneys nearby. The damage is estimated at $3000 and the plant will probably not be rebuilt.

The Walsh Sand and Gravel Co., Marinette, Wis., of which John Marsch, president of the Wisconsin and Michigan Railroad Co., is president, has started operating. All the equipment has been procured and gravel will be taken near Walsh for service in the expansion plan of the Wisconsin and Michigan.

The Magna Sand Corp., Philadelphia, Pa., has increased its capital stock from $50,000 to $70,000.

The Hastings Gravel and Construction Co., Hastings, Mich., has installed its steam shovel and will be in operation shortly. The plant is modernly equipped and will have a daily capacity of 750 cu. yd. of sand and gravel. W. H. Fry, Bedford, is president; F. Horton, vice-president, and W. G. Bauer, secretary-treasurer, both of Hastings.

The Lincoln Sand and Gravel Co. must bear the entire expense of the construction and maintenance of an interlocking plant at the crossing of the single track of the Illinois Traction System at the plant near Lincoln, Ill., according to an order handed down by the Illinois Commerce Commission. The case involving the cost of installing the interlocker has been before the commission for some time and the final order comes after a rehearing of the case. The plant will be operated on a 24-hr. basis.

The West Virginia Sand and Gravel Co., Gallipolis, Ohio, has purchased the Pittsburgh pool towboat "Robert Jenkins," which is 132 ft. long, 22 ft. beam, and has 15x6 engines. The boat will be used in the Kanawha river.

The "Charles Dix," a gravel boat from Canada, put in the harbor at Dunkirk, N. Y., and unloaded 930 yd. of gravel to be used in city improvement work.

The Capay Gravel Co., Sparta, Calif., has started operating at capacity.

The Missouri Sand and Gravel Co., Caruthersville, Mo., recently organized, is in process of formation, with N. W. Helm, S. Hayes and L. P. Cantrell as owners. The company has purchased approximately seven acres on the Mississippi river and will also operate a barge. The company's total investment will amount to $25,000. It contemplates building a concrete product factory to manufacture drain tile later on.

The Brantford Sand and Gravel Co., Ltd., has recently enlarged its plant at Brantford, Ont., increasing its capacity to about 45 cars per day. It is capitalized at $200,000.

The gravel washer at the Pendleton, Ind., reformatory site is now operating in full and turning out 300 to 400 yd. of gravel daily, to be increased to 700 yd. The reformatory is now furnishing all of the gravel needed in construction work.

The Seaboard Sand and Gravel Corp., 26 Cortlandt street, New York, will install machinery at its properties at Port Jefferson, L. I., for digging, hoisting, conveying, etc., with power equipment to cost in excess of $200,000 The company has over 800 acres and has recently secured a loan in the amount noted to be used in part for the installation. George W. Loft and W. Butler Duncan head the organization.

The Wood Brothers Gravel Plant at Port Angeles, Wash., has been purchased by E. E. Nichols and Dick and Fred Owens, who are contemplating improvements at the plant. A spur track from the Milwaukee will also be laid.

Gypsum

The Atlantic Development Co., Ltd., Halifax, N. S., is considering establishing a plaster quarry at Baddeck, N. S.

Quarries

J. J. Fisher and W. F. Gerdes were appointed by Mayor Smiley, of Quincy, Ill., as two of three members of the newly created municipal quarry commission and have full power to select superintendent and assistants, fixing the compensations for services, purchasing materials and maintaining the plant. Mr. Fisher will serve one year and Mr. Gerdes two years.

The Traventine Quarries, near Bridgeport, Nevada, have been purchased by Oakland capital and development work has started. C. L. Hayes, Bridgeport, is one of the owners.

The Mechlin Stone Co., Columbus, Ohio, formerly known as the Capital Stone Co., has been reorganized. Officers are M. Mechlin, president; J. C. McIntyre, vice-president; and H. S. Kerr, secretary. The new firm has added $15,000 worth of new machinery at its quarries.

The Kiggins Quarry Products Co., near Litchfield, Ill., recently incorporated, will be ready for operation by August 1. It will produce agricultural limestone (analysis 92 to 96 Ca Co_3) and all kinds of commercial limestone. The State Highway Department tests for road building purposes show the stone tested 10½ while the French coefficient is 6. The quarry is so located that it can have a switch on both the Big Four railroad and Illinois Traction system. It is in the switching limits of Litchfield, making available six different railroads. E. B. Necholas has charge of the plant.

The Rand Construction Co., Bethany, Mo., is opening up a new quarry south of Bethany. The rock has been approved by the state department as suitable for paving. A strip 300x150 ft. will be exposed and stripping has begun.

(Continued on page 58)

The Keokuk Quarry and Construction Co. has moved its plant from Hamilton to Elvaston, Ill.

Guy F. Harvey, district highway engineer, has purchased the rock quarry on the C. F. Wilke farm, northeast of Davenport, Iowa, for the state. Drilling will start at once and a rock crusher set up.

The quarry on the Y. B. Reed farm, east of Trenton, Texas, is being operated, and the stone will be used on highways in that section.

H. P. Lawrence, Royal Center, Ind., has been drilling and making tests of limestone on the farm of Mrs. Teresa Baker, east of Logansport. Tests have been made in search of gray limestone. If the grade of limestone is satisfactory, probably a quarry plant will be established. W. B. Newberry, Cleveland, Ohio, is having the tests made.

The Manitoba Stone Co. is considering the location of a branch plant at either Toronto or Hamilton, Ont.

The Asbestos Corp. of Canada, Ltd., Thedford Mines., Quebec, recently had a fire at its plant causing damage to the extent of $400,000 to the building and $250,000 to equipment and contents. The company intends to rebuild.

The American Crushed Rock Co., 36th street and Rainbow avenue, Kansas City, Mo., is planning the installation of steam power equipment, drilling and other machinery.

The Sonora Granite Co., Jamestown, Calif., at a meeting of the stockholders voted to increase the capital stock and to enlarge its plant by adding a finishing unit and other improvements.

The Moretti White Marble Co., Sylacauga, Ala., plans opening its new plant at Sylacauga shortly. A track from the Louisville & Nashville railroad has been completed. Mr. Moretti of Pittsburgh, Pa., is president.

The Granite Dealers Corp., Llano, Texas, recently chartered, is making extensive improvements at its quarry 12 miles west of Llano. New machinery will be installed to double the plant's capacity. Owners are G. Faubion and L. H. Baldwin, Llano, and Philip Welhausen, San Antonio.

Agstone

County Agent J. B. Keenen declares that nearly every farm in Grant county needs at least 2 ton of limestone to the acre to produce alfalfa. One thousand tons of limestone will be ground during July from six different quarries in various parts of the county and available to farmers.

The Ohio Agricultural Experiment Station, Columbus, Ohio, in an 8 year average shows an increase in farm crops, valued as follows: Two tons of limestone applied on ground plowed for corn, $14.62. On ground plowed for wheat $14.35. On new seeding for clover, $11.34. On sod before plowing for corn $14.14. Mr. Williams, of the experiment station, believes a good time to apply limestone is on the clover sod just before plowing for wheat this fall. Pulverized limestone can be laid down at any station in the county at close to $2.00 a ton, including all expenses in laying down the limestone at the station. A 2 ton to the acre application should keep the land in good condition for 8 years.

W. A. Ostrander, soils and crops expert of Purdue University will be at Vevay, Ind., to hold a number of meetings, during a campaign for interesting and instructing farmers in the use of limestone on the fields, which is to be put on throughout 12 or more counties in southeastern Indiana during the week of July 23 to 28.

G. D. Blake, Atkinson, Me., is preparing to open a quarry on his farm for land lime, after tests from University of Maine show it is superior to Canadian lime, which sells there for $8 a ton.

Farmers of Bartholomew county, Ind., attended the lime crushing demonstration at the plant of Elmer Jackson, near Burnsville. An effort will be made to install more crushers in the county in the near future.

E. J. Rice, Mountain Grove, Mo., will operate a limestone quarry on his farm west of Houston, Mo., and will have it in operation August 1. The crushed lime rock will be sold at the quarry for $2.50 per ton.

Phosphate Rock

The Export Chemical Co. is having plans drawn for its plant near Tampa, Fla., by the Chemical Construction Co., Charlotte, N. C. It is said that the plant will be the largest for the manufacture of concentrated fertilizer in America. Buildings will cost more than a million dollars. The company is capitalized at $2,350,000. P. S. Gilchrist of Charlotte is chairman of the board of directors, and Mangum Welch of Charlotte, secretary and treasurer. Lorenzo Wilson of Jacksonville, Fla., is president of the company.

The American Cyanamid Co., 511 Fifth avenue, New York, phosphoric acid plant at Brewster, Fla., was destroyed by fire June 28 with a loss estimated at $400,000, including machinery and power equipment. The plant was operated in conjunction with the Virginia-Carolina Chemical Co., Richmond, Va.

Silica Sand

The Silica Brick and Products Co., Camden, N. J., has been chartered with a capital of 10,000 shares of stock, no par value, to operate a local plant for the manufacture of high grade silica brick and kindred products. The company is headed by S. Beitle, Jr., and E. S. Sharpless. S. R. Leap represents the company, with office at 506 Market street, Camden.

Concrete Products

The Nevada Magnesite Products Co., Reno, Nevada, recently organized, is planning for the construction of a plant for the production of artificial stone products, including tiles, blocks, etc., utilizing magnesite under a special process. A large raw material deposit has been secured about 8 miles from Reno. Charles H. McCarthy is president, and Paul Butler vice-president.

The Aluminate Cement Co., Philadelphia, Pa., has been incorporated for $150,000. Representative is the Corporation Guarantee & Trust Co., Land Title Bldg., Philadelphia.

The San Tile Co., Milwaukee, Wis., has been incorporated for $100,000 by E. A. Lueck, E. E. Bruhn and G. Herff.

The Concrete Units, Ltd., Toronto, Ont., has been incorporated for $40,000 to manufacture concrete block, tile, etc.

The International Concrete Corp., Chicago, Ill., has changed its name to International Concrete Industries Corp., and increased its capital from $1,000,000 to $1,050,000.

The Worrall Brothers Co., Louisville, Ky., recently completed one of its most modern concrete products plants. It has a capacity of 3600 blocks per day and yardage space to accommodate more than 100,000 blocks. The plant is operated by electric power entirely. R. R. Worrall and M. M. Worrall are the owners.

The Cement Products Mfg. Co., Roanoke, Va., will soon break ground for a new plant at Wasena for the manufacture of tile blocks and other cement products. Presses, power equipment and other machinery will be installed.

Dealers

The Canada Lime Stone Co., Ltd., Quebec, Que., has been incorporated for $20,000 to deal in limestone, sandstone, granite, marble, etc.

The Cardiff Marble Sales Corp., Syracuse, N. Y., has been incorporated to deal in marble and quarry products. Incorporators are R. G. Roesch, B. R. Johnson, 6203 Salina street, and C. H. Holmes, 305 Montgomery street.

The Barber Construction Co., Dover, N. Y., has been incorporated for $50,000 to deal in concrete, asphalt, etc. Attorney is U. S. Corporation Co.

The Klein Material Co., Brooklyn, N. Y., has been incorporated for $30,000 by L. Klein, M. Cohen, to deal in building materials. Attorney is D. Herman, 51 Chambers street.

The Beaumont Building Material Co., Beaumont, Texas, has succeeded the Texas Building Material Co.

Manufacturers

The Ottumwa Box Car Loader Co., Ottumwa, Iowa, has established the following agencies: J. F. Harvey, 307 Dooly Bldg., Salt Lake City, Utah, for Utah, Montana and that part of Wyoming west of a line drawn directly north and south through Rock Springs and including the Rock Springs coal field; E. C. Horne Machinery Co., 1751 Wazee street, Denver, Colo., for Colorado, New Mexico and that part of Wyoming east of Rock Springs; Scranton Electric Construction Co., Scranton, Pa., that part of the state of Pennsylvania including the anthracite field.

Personal

Kirby Thomas, consulting engineer, of New York, is making investigation of limestone products in Butler county, Pennsylvania, and molding sand deposits in Ohio.

George Oakley, Jr., Toronto, Ont., dealer in stone, has been elected a member of the Ontario provincial legislature.

J. C. Bloomfield, for a number of years with the R. W. Hunt Co., Chicago, has taken charge of the Industrial Works, 1051 McCormick Bldg., Chicago, handling the sale of Industrial equipment in that territory.

Arthur S. Nestor of Chicago was elected president of the Monmouth Stone Co., Monmouth, Ill., at a recent meeting of the directors, to succeed George S. Tracey, who recently resigned. Mr. Nestor has been acting as managing director of the concern and as president will devote all his time to reorganization of the company. I. M. Eastman has been re-elected treasurer.

E. J. Wilkie has been appointed Northern sales manager of the Bucyrus Co., South Milwaukee, Wis., succeeding E. R. Weber, who has resigned. Mr. Wilkie will have general charge of the sale of Bucyrus products in Wisconsin, Minnesota, North and South Dakota, upper peninsula of Michigan and eastern Montana, with headquarters in South Milwaukee.

Trade Literature

"Baby Shovel" Instruction Book—Bulletin 100, issued by the Hoar Shovel Co., Inc., Duluth, Minn., is a book of directions for installing, operating and ordering replacements for the Hoar mechanical loading, digging and shoveling machine. The general description of this machine is given in detail, following which are numerous illustrations showing the operations—commencing to dig, completing the dig, the swing and the dumping. Then follows the diagrams showing how to assemble the machine, the truck, the base of frame, the carriage, double dipper, stick, the dipper, the operating levers, stands, etc. Space is also given to the lubrication and piping.

Truck Crane—With the title, "Byers Truckrane," the Byers Machine Co., Ravenna, Ohio, has recently issued a 16-page catalog illustrating and describing its truck crane. This catalog tells how the crane operates, the kind of power it uses, the work it will do and how much. "The Truckrane," says the company, "provides the capacity, operating speed, and labor-saving mechanical features of a rugged, sturdy, industrial crane, plus the movability and traveling speed of the motor truck on which it is mounted, and is offered as a fully developed and thoroughly practical working unit. We did all the experimenting before we filled our first order."

"Frankly, Your Hoist Needs a Blaw Bucket" is the title of a folder recently issued by the Blaw-Knox Co., Pittsburgh, Pa., in which is set forth the arguments for adopting the advice given in this title. The buckets of this company are shown in detail, together with their specific applications "on the job." There is also a handy reference table to assist in the selection of the bucket best suited to a particular use.

Densities and Uses of Grease—This is the title of a small booklet issued by the Keystone Lubricating Co., Philadelphia, Pa. Says the company: "It is now conceded by lubricating engineers that grease must be made in different densities or consistencies to suit various mechanical conditions—heavy, viscous greases for heavy, slow-speed bearings, high point melting greases for bearings required to operate under high heat conditions, and lighter, less viscous densities for lighter and higher-speed bearings. All the knowledge of scientific plant lubrication gathered by our engineers is at your disposal." This booklet describes the various densities from No. 000 to No. 6, as well as high melting-point greases. Grease cups and manifold safety lubricators are also included.

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Air Compressors
Pennsylvania Pump & Compressor Co., Easton, Pa.
Worthington Pump & Mchy. Corp., New York City

Air Separators
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.

Automatic Weighers
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Babbitt Metal
Lewistown Fdy. & Machine Co., Lewistown, Pa.

Bags and Bagging Machinery
Jaite Co., Jaite, Ohio

Balls (Tube Mill, etc.)
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Worthington Pump & Mchy. Corp., New York City

Belt Fasteners and Hooks
Crescent Belt Fastener Co., New York City

Belt Lacing and Rivets
Crescent Belt Fastener Co., New York City

Bins and Bin Gates
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Easton Car and Construction Co., Easton, Pa.
Smith Engineering Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Blasting Supplies
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

Boiler Insulation
Celite Products Co., Chicago, Ill.

Boilers (Return and Water Tube)
Edge Moor Iron Works, Edge Moor, Del.
Jackson & Church Co., Saginaw, Mich.

Boilers (Waste Heat)
Edge Moor Iron Works, Edge Moor, Del.

Box Car Loaders
Ottumwa Box Car Loader Co., Ottumwa, Iowa

Brick Machinery
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Jackson & Church Co., Saginaw, Mich.
Shope Brick Co., Portland, Ore.

Bricks—Insulating
Celite Products Co., Chicago, Ill.

Buckets (Elevator and Conveyor)
American Manganese Steel Co., Chicago Heights, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Smith Eng. Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Weller Mfg. Co., Chicago, Ill.

Buckets (Grab, Clambshell, etc.)
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Industrial Works, Bay City, Mich.
McMyler Interstate Co., Cleveland, Ohio
Orton & Steinbrenner, Chicago, Ill.

Burr Mills
J. B. Ehrsam & Sons, Mfg. Co., Enterprise, Kan.
Munson Mill Machinery Co., Utica, N. Y.

Cableways
Interstate Equipment Corp., New York, N. Y.
Lidgerwood Mfg. Co., New York, N. Y.

Calcining Kettles (Gypsum)
American Process Co., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kan.

Car Pullers
Ottumwa Box Car Loader Co., Ottumwa, Iowa
Thomas Elevator Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Cars (Quarry)
Atlas Car & Mfg. Co., Cleveland, Ohio
Easton Car and Construction Co., Eston, Pa.

Cement—Insulating
Celite Products Co., Chicago, Ill.

Chain (Steam Shovel)
Carroll Chain Co., Columbus, Ohio

Chain Drives
Dodge Mfg. Corp., Mishawka, Ind.
Morse Chain Co., Ithaca, N. Y.

Clamps
Knox Mfg. Co., Philadelphia, Pa.

Clutches
Dodge Mfg. Corp., Mishawaka, Ind.

Coal Pulverizing Equipment
American Pulverizer Co., St. Louis, Mo.
Fuller-Lehigh Co., Fullerton, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Williams Pat. Crusher & Pulv. Co., Chicago, Ill.

Colors (Cement and Mortar)
C. K. Williams & Co., Easton, Pa.

Conveyors and Elevators
Austin-Western Road Machinery Co., Chicago, Ill.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Dodge Mfg. Corp., Mishawaka, Ind.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Link-Belt Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Universal Crusher Co., Cedar Rapids, Iowa
Williams Pat. Crusher & Pulverizer Co., Chicago, Ill.

Core Drilling
Pennsylvania Drilling Co., Pittsburgh, Pa.

Couplings
Knox Mfg. Co., Philadelphia, Pa.

Cranes (Crawler)
Brown Hoisting Mchy. Co., Cleveland, Ohio
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler Interstate Co., Cleveland, Ohio
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Locomotive)
American Hoist & Derrick Co., St. Paul, Minn.
Brown Hoisting Mchy. Co., Cleveland, Ohio
Byers Machine Co., Ravenna, Ohio
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Northwest Engineering Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., Marion, Ohio

Cranes (Overhead Electric Traveling)
Morgan Engineering Co., Alliance, Ohio

Crushers (Hammer)
American Pulverizer Co., St. Louis, Mo.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Pennsylvania Crusher Co., Philadelphia, Pa.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Austin-Western Rd. Mchy. Co., Chicago, Ill.
C. G. Buchanan Co., New York City
Butterworth & Lowe, Grand Rapids, Mich.
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kan.
Good Roads Mchy. Co., Kennett Square, Pa.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Lewistown Fdy. & Machine Co., Lewistown, Pa. (Jaw)
Morgan Engineering Co., Alliance, Ohio
New Holland Machine Co., New Holland, Pa.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa
Universal Road Mchy. Co., Kingston, N. Y.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo. (Jaw)
Worthington Pump & Mchy. Corp., New York City

Crushing Rolls
C. G. Buchanan Co., New York City
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
McLanahan Stone Machine Co., Hollidaysburg, Pa.
New Holland Machine Co., New Holland, Pa.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Derricks
Lidgerwood Mfg. Co., New York, N. Y.
Thomas Elevator Co., Chicago, Ill.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co., Chicago Heights, Ill.

Draglines
Erie Steam Shovel Co., Erie, Pa.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Dragline Cableway Excavators
Sauerman Bros., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Dredge Chain
Carroll Chain Co., Columbus, Ohio

Dredges (Sand and Gravel)
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.
Thomas Elevator Co., Chicago, Ill.

Drills (Blast Hole)
Armstrong Mfg. Co., Waterloo, Iowa
Sanderson-Cyclone Drill Co., Orrville, Ohio

Dryers
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Process Co., New York, N. Y.
Buckeye Dryer Co., Chicago, Ill.
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Dust Collecting Systems
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

Engineers
J. C. Buckbee Co., Chicago, Ill.
Robt. W. Hunt & Co., Chicago, Ill.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Kritzer Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
H. Miscampbell, Duluth, Minn.
Pennsylvania Drilling Co., Pittsburgh, Pa.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Williams Pat. Crush & Pulv. Co., Chicago, Ill.
R. D. Wood & Co., Philadelphia, Pa.

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Atlas Portland Cement Company, Hamburg, N. J.
Calumet & Arizona Mining Co., Bisbee, Arizona
The Dome Mines Company, Ltd., South Porcupine, Ont., Can.
Goldfield Cons. Mines Co., Goldfield, Nevada
M. A. Hanna & Company, Duluth, Minn.
The International Nickel Co. of Canada, Copper Cliff, Ont., Can.
Menantico Sand & Gravel Co., Millville, N. J.
Palermo Sand & Stone Company, Ocean City, N. J.
Phelps Dodge Corporation, Lowell, Arizona
Portland Contracting Company, Pottsville, Pa.
Ulen Contracting Company, Shandaken, N. Y.
Rock Island Sand & Gravel Co., Rock Island, Ill.
Tulsa Sand Company, Tulsa, Okla.

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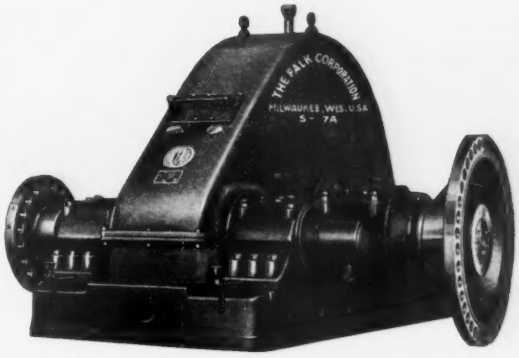

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M. P. Fillingham, 50 Church St., New York City.
F. W. Grimwood, Rialto Bldg., San Francisco, Cal.
Vulcan Iron Works, Wilkes-Barre, Pa.
General Machinery Co., Brown Marx Bldg., Birmingham, Ala.
Denver Engineering Works, Denver, Colo.
Engineering Equipment Co., Ltd., 358 Beaver Hall Sq., Montreal, Quebec, Canada.

Foreign Representatives: Gustav Melms, 3 Rue Taitbout, Paris

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

Engines (Gasoline, Kerosene and Oil)
American Hoist & Derrick Co., St. Paul, Minn.
Armstrong Mfg. Co., Waterloo, Iowa
Climax Eng. Co., Clinton, Iowa
Worthington Pump & Mchy. Corp., New York City

Engines (Steam)
American Hoist & Derrick Co., St. Paul, Minn.
Climax Eng. Co., Clinton, Iowa
Ellicott Machine Corp., Baltimore, Md.
Jackson & Church Co., Saginaw, Mich.
Morris Machine Works, Baldwinsville, N. Y.

Explosives (Dynamite, Powder, etc.)
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

Frogs and Switches
Central Frog & Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.

Fuses (Detonating and Safety)
Atlas Powder Co., Wilmington, Del.
E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Hercules Powder Co., Wilmington, Del.

Gas Producers
R. D. Wood & Co., Philadelphia, Pa.
Morgan Construction Co., Worcester, Mass.

Gears (Spur, Helical, Worm)
Falk Corp., Milwaukee, Wis. (Helical)
Link-Belt Co., Chicago, Ill.

Grizzlies
Robins Conveying Belt Co., New York City
Smith Eng. Works, Milwaukee, Wis.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.

Gypsum Plaster Plants
Butterworth & Lowe, Grand Rapids, Mich.
J. B. Ehrsam & Sons Mfg. Co., Enterprise, Kans.

Hoists
Hyman-Michaels Co., Chicago, Ill.
Industrial Works, Bay City, Mich.
Jackson & Church Co., Saginaw, Mich.
Lidgerwood Mfg. Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

Hydrators (Lime)
Kritzer Co., Chicago, Ill.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Insulation (Heat)
Celite Products Co., Chicago Ill.

Kilns (Rotary)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
H. Miscampbell, Duluth, Minn.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

Kilns (Shaft)
McGann Mfg. Co., Inc., York, Pa.
H. Miscampbell, Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Lime Handling Equipment
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
McGann Mfg. Co., Inc., York, Pa.
H. Miscampbell, Duluth, Minn.
Raymond Bros., Impact Pulv. Co., Chicago, Ill.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Sturtevant Mill Co., Boston, Mass.

Liquid Fuel Equipment
W. N. Best Furnace & Burner Corp., New York City

Loaders and Unloaders
Hoar Shovel Co., Duluth, Minn.
Link-Belt Co., Chicago, Ill.
Northwest Engineering Co., Chicago, Ill.
Ottumwa Box Car Loader Co., Ottuwma, Iowa

Locomotives (Steam, Gas and Electric)
Baldwin Loco. Wks., Phila., Pa. (Gas & Elec.)
Davenport Loco. Wks., Davenport, Iowa (Steam)
Fate-Root-Heath Co., Plymouth, Ohio (Gas)
Hadfield-Penfield Steel Co., Bucyrus, Ohio (Gas)
Ironton Eng. Co., Ironton, Ohio (Elec.)
Lima Locomotive Works, Lima, Ohio (Steam)
Milwaukee Loco. Mfg. Co., Milwaukee, Wis. (Gas)
Vulcan Iron Works, Wilkes-Barre, Pa. (Steam)

Lubricating Systems
Ottumwa Box Car Loader Co., Ottuwma, Iowa

Manganese Steel (Castings, Repairs, etc.)
American Manganese Steel Co., Chicago Heights, Ill.

Mills, Grinding (Ball, Tube, etc.)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Butterworth & Lowe, Grand Rapids, Mich.
Jackson & Church Co., Saginaw, Mich.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Lewistown Fdy. & Machine Co., Lewistown, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Worthington Pump & Mchy. Corp., New York City

Nipples
Knox Mfg. Co., Philadelphia, Pa.

Nozzles
Knox Mfg. Co., Philadelphia, Pa.

Perforated Metal
W. Toepfer & Sons Co., Milwaukee, Wis.
Hendrick Mfg. Co., Carbondale, Pa.
Cross Engineering Co., Carbondale, Pa.

Pipe (Dredge, etc.)
R. D. Wood & Co., Philadelphia, Pa.
Morris Machine Works, Baldwinsville, N. Y.

Pulverizers
American Pulverizer Co., St. Louis, Mo.
Fuller-Lehigh Co., Fullerton, Pa.
K-B Pulverizer Co., Inc., New York City
Kent Mill Co., Brooklyn, N. Y.
Munson Mill Machinery Co., Utica, N. Y.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Crusher Co., Cedar Rapids, Iowa
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
Ellicott Machine Corp., Baltimore, Md.
Morris Machine Works, Baldwinsville, N. Y.

Pumps (Water, etc.)
Emerson Pump and Valve Co., Alexandria, Va.
Webb City & Carterville Fdy. & Mch. Works, Webb City, Mo.
Worthington Pump & Mchy. Corp., New York City

Rails
Easton Car and Construction Co., Easton, Pa.

Road Machinery
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Good Roads Machinery Co., Kennett Square, Pa.
Koehring Co., Milwaukee, Wis.
Northwest Eng. Co., Chicago, Ill.

Scrapers (Drag, etc.)
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.

Screens
Austin-Western Rd. Mchy. Co., Chicago, Ill.
Cross Engineering Co., Carbondale, Pa.
Dodge Mfg. Corp., Mishawaka, Ind.
Good Roads Machinery Corp., Kennett Square, Pa.
Harrington & King Perforating Co., Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City
Kent Mill Co., Brooklyn, N. Y.
McLanahan Stone Mach. Co., Hollidaysburg, Pa.
Northwest Eng. Co., Chicago, Ill.
Robins Conveying Belt Co., New York City
Sturtevant Mill Co., Boston, Mass.
W. Toepfer & Sons Co., Milwaukee, Wis.
Traylor Eng. & Mfg. Co., Allentown, Pa.
W. S. Tyler Co., Cleveland, Ohio
Universal Crusher Co., Cedar Rapids, Iowa
Weller Mfg. Co., Chicago, Ill.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

Shovels (Steam, Gas and Electric)
Erie Steam Shovel Co., Erie, Pa.
Hoar Shovel Co., Duluth, Minn.
Koehring Co., Milwaukee, Wis.
Northwest Engineering Co., Chicago, Ill.
Osgood Co., Marion, Ohio

Sprockets and Chain
American Mangansee Steel Co., Chicago Heights, Ill.
Dodge Mfg. Corp., Mishawaka, Ind.

Steel Plate Construction
Hendricks Mfg. Co., Carbondale, Pa.
Jackson & Church Co., Saginaw, Mich.

Testing Sieves and Shakers
W. S. Tyler Co., Cleveland, Ohio

Track Equipment
Central Frog and Switch Co., Cincinnati, Ohio
Easton Car and Construction Co., Easton, Pa.

Tramways (Aerial Wire Rope)
Interstate Equip. Corp., New York City
A. Leschen & Sons Rope Co., St. Louis, Mo.

Transmission Machinery
Dodge Mfg. Corp., Mishawaka, Ind.
Kritzer Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

Underground Loaders
Hoar Shovel Co., Duluth, Minn.

Valves and Valve Couplings
Emerson Pump and Valve Co., Alexandria, Va.
Knox Mfg. Co., Philadelphia, Pa.

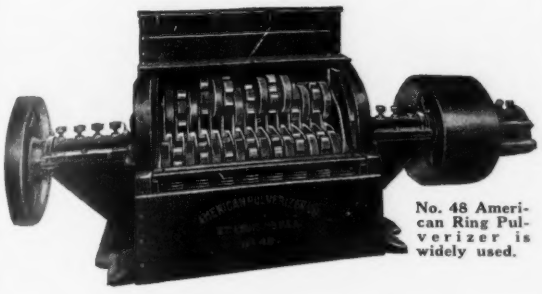
Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Good Roads Mchy. Co., Kennett Square, Pa.
Lewistown Fdy. & Machine Co., Lewistown, Pa.
McLanahan Stone Machine Co., Hollidaysburg, Pa.
Smith Eng. Wks., Milwaukee, Wis.

Weighing Equipment
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

Wheels (Car)
Easton Car and Construction Co., Easton, Pa.

Wire Cloth
Cleveland Wire Cloth Co., Cleveland, Ohio
Twin City Iron & Wire Works, St. Paul, Minn.
W. S. Tyler Co., Cleveland, Ohio

Wire Rope
American Steel & Wire Co., Chicago, Ill.
Armstrong Mfg. Co., Waterloo, Iowa
A. Leschen & Sons Co., St. Louis, Mo.



No. 48 American Ring Pulverizer is widely used.

The World's Greatest Crushing Force

Here is a crusher that does its work with rings—powerful rings of manganese steel. A one ton striking force and a centrifugal force of 3500 pounds is behind every blow. Just imagine such power applied 10 times a second at any given point. That is the disintegrating principle of the

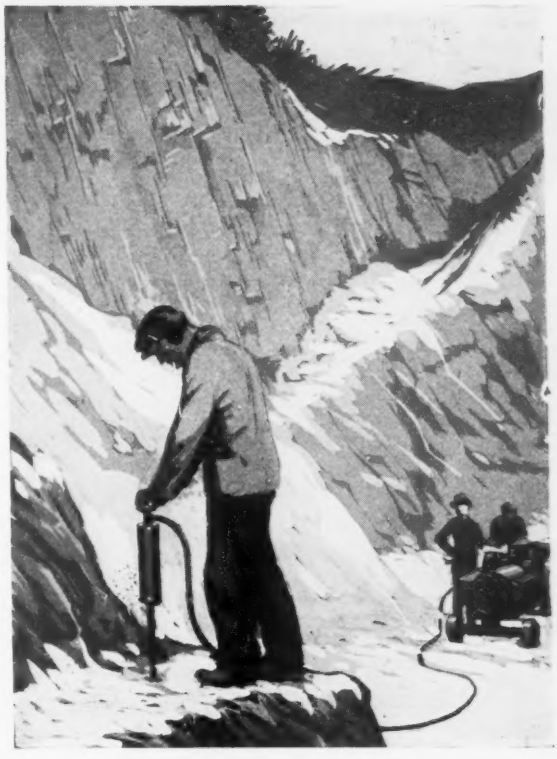
American Ring Pulverizer

If you pulverize a refractory material, you will be interested in the pulverizer that will do your work at the ***proved*** lowest operating cost; that has a guarantee unapproached by any other crusher in the world and that has hundreds of friends who are in the business of crushing rock.

Just let us know that you have a crushing problem and a trained engineer will be on the job within 48 hours. Remember, of course, that your invitation for him to call is without commitment on your part.

American Pulverizer Company
"We Crush Everything"
18th and Austin Sts. St. Louis, U. S. A.

ATLAS
EXPLOSIVES
for quarrying



IN practically every kind of quarry blasting Atlas Ammite will do better work—and at less cost. Furthermore, as Ammite will not freeze and the usual powder headache is eliminated when handling, its use saves the time and labor lost through these objectionable features. Let the Atlas Service Man help you determine what grade of Ammite will save the most money for you.

AMMITE
—cannot freeze—

ATLAS POWDER COMPANY
WILMINGTON, DELAWARE

Branch Offices:
Allentown, Pa.; Birmingham, Ala.; Boston, Mass.; Charleston, W. Va.; Chicago, Ill.; Des Moines, Iowa; Houghton, Mich.; Joplin, Mo.; Kansas City, Mo.; Knoxville, Tenn.;

ATLAS EXPLOSIVES

Branch Offices:
McAlester, Okla.; New Orleans, La.; New York City, N. Y.; Norristown, Pa.; Philadelphia, Pa.; Pittsburg, Kans.; Pittsburgh, Pa.; Pottsville, Pa.; St. Louis, Mo.; Wilkes-Barre, Pa.

We consider our

INDUSTRIAL CRANE

Performs the Work of at Least 50 Laborers per Day

So states Mr. George Langford, Gen. Supt. of the McKenna Process Company of Illinois, at Joliet, Ill.

With an INDUSTRIAL available for dozens of different jobs with clam shell or dragline bucket, hook and block for heavy unit lifts; convertible with attachments for steam shovel and pile driving operations, the number of laborers replaced is certainly many.

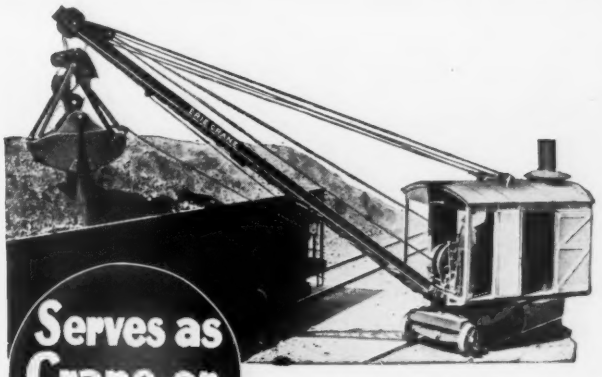
Our Golden Anniversary Catalog Now Ready for Mailing

Industrial Works, Bay City, Michigan

New York Chicago Philadelphia Detroit

SALES ENGINEERS IN ALL PRINCIPAL CITIES

1873 BUILDERS OF CRANES FOR 50 YEARS 1923



Serves as Crane or Steam Shovel

Every ERIE can be quickly and easily changed over to a Locomotive Crane. Gives excellent service with clamshell bucket—excavates gravel, loads cars, handles storage, etc.

In the hardest steam shovel service, gravel producers and quarrymen have found the ERIE very sturdy and reliable.

"Our first ERIE has been digging hard gravel for 3 years without any repairs. We have in the past operated other steam shovels that are good, but the ERIE is the best, being by far the most substantial." Write the Standard Builders' Supply Co., Grand Rapids, Mich. They own 2 ERIES, a Steam Shovel and a Crane.

Write for Bulletin P-16, showing just what you can do with the ERIE, both as crane and steam shovel.

ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.

Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

Flirting With the Shovels

In the game of crushed stone quarrying a drill that is within flirting distance with steam shovel or the loading gangs is in a dangerous position. A breakdown on the drill, and the whole production schedule is upset.

No. 14 Cyclone Drills, on the job, always keep plenty of stone ahead, and if they should ever be crowded there is no need for worry—the working parts are cast steel, reducing to the very minimum all possibility of breakdowns.

Write for "Big Blast Hole Drills," a semi-technical treatise on quarry drilling and also containing a complete description of Cyclone No. 14 Big Blast Hole Drills.

The Sanderson-Cyclone Drill Co.

Orrville, Ohio

Eastern and Export Office: 30 Church Street, New York City

OSGOOD 120—6 yd. Loading Heavy Rock

The Trend of the Times Is Forward

OSGOOD Steam Shovels are daily adding to the Trend of the Times thru constant and efficient service. Pit and Quarry men find them a reliable aid to their business.

See an OSGOOD at work

¾ and 1 yd. Revolving types
1½ to 6 yd. Railroad types

Descriptive Bulletin on Request

The OSGOOD Company

Marion, Ohio

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

FOR SALE

1—8x125 ft. Rotary Kiln
1—7x100 ft. Rotary Kiln
1—6x115 ft. Rotary Kiln
2—7x5½x60 ft. Rotary Dryers
1—5½x22 ft. Tube Mill
1—4x16 ft. Tube Mill
1—5x9 ft. Tube Mill
2—33 in. Fuller Mills
1—Williams No. 2 Deck Sweeper
1—No. 3 Williams Mill—Lawrence Pattern
1—No. 4 Williams Mill
1—No. 5 Williams Mill—Jumbo
2—12 ton, 36 in. gauge, Porter Saddle Tank Locomotives
1—Browning Standard Combination Drag Line and Shovel, 2½ yd. bucket
1—Belt Driven Hoist, Drum 5x5 ft.

EQUIPMENT SALES COMPANY
Nashville, Tennessee
"If we don't have it we will get it"

1—50-ton standard gauge Brooks 6-wheel switcher.
1—28-ton standard gauge Shay geared locomotive.
2—10x16" 36" gauge 4-wheel saddle tank locomotives.
2—9x14" 36" gauge 4-wheel saddle tank locomotives.
1—14-B Bucyrus steam shovel, mounted on traction wheels.
2—18-ton O&S bucket handling locomotive cranes.
10 Miles 30-lb. and 35-lb. relay steel rails, Natalbany, La.

Birmingham Rail and Locomotive Co.
Birmingham, Ala.

SPECIAL BARGAINS
Send Us Your Boiler Inquiries

66x86 in. TRAYLOR JAW CRUSHING PLANT.
25-50-80-110 HP. Elec. Hoists.
Nos. 4-5-6-7½-9 and 10 CRUSHERS.
6 and 10 ton Gasoline Locomotives.
2-DISC CRUSHERS, 24, 28 and 36 in.
100 TON 2½ yd. ELECTRIC SHOVEL.
50-5000 ft. Steam Belt and Electric Compressors.
13x30 in.; 10x18 in.; 8x14 in. JAW CRUSHERS.
24x54 MC LANAHAN ROLL CRUSHERS.
50 HP. D. D. HOIST, 440 V. 3 Ph. Motor Dragline Set; Also 25 HP. Dragline Equip.
New G. E. Gas Engine Sets, 5-25-kw. 125-250-V.
3 60-HP. GASOLENE 5-D HOISTS, PRAC. NEW.
10 and 12 ton ROAD ROLLERS.
5-7½ and 10 HP. PORTABLE CONVEYORS
750-1000 GPM. UNDERWRITERS STEAM PUMPS.
NEW No. 5 GYRATORY CRUSHER (MICHIGAN)

Send Us Your Inquiries for Your Wants
ROSS POWER EQUIP. COMPANY
Indianapolis, Ind.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.

KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.

MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20', 5x11', 5x20', 5½x22' and 6x20' tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½', 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.
Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

WANTED

1—2½ yard, standard, Marion dipper for Model 70 Marion Shovel, to be used in digging stone. Must be in first-class condition. Address

The National Lime & Stone Co.
Carey, Ohio

Cement Mill Machinery and Motors For Sale

1—New 6 ft. diameter x 22 ft. long Bonnot Tube Mill, complete with metal lining. Machine has water cooled bearings and is belt driven.

1—Used 8 ft. diameter x 6 ft. long Kennedy-Van Saun Ball Mill, complete with drive pulley, liners and balls.

1—Used Westinghouse induction motor, slip ring type, 200 HP., 440 volts, 60 cycle, 3 phase, 580 RPM., complete with drum controller, resistance and circuit breaker. In first class condition.

1—Used Westinghouse motor, slip ring type, 400 HP., 440 volts, 60 cycle, 3 phase, 500 RPM., complete with control panel, resistance and circuit breaker, but without bed plate. In first class condition and suitable for direct drive.

KENNEDY REFRACTORIES CO.
Tiffin, Ohio

ROTARY DRYERS
30 New Direct Fired Rotary Dryers
4 ft. 0 in. diameter, 30 ft. long

These Dryers were about to be put into operation as the Armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace irons, grates, etc. Some are equipped with steam radiators for steam heated air drying.

McDERMOTT BROS CO.
Allentown, Penna.

For Sale—STEAM SHOVEL
⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

FOR SALE

1—6K Gates Crusher
1—4B Gates Crusher
15—4½ to 5 ton steel body, end dump, heavy duty standard gauge quarry cars, new, 1922
1—Switching Locomotive, standard gauge
1—70 ton Steam Shovel, 2½ yd. bucket
Will sell any or all at very low prices

Inland Crushed Stone Co.
105 North Clark St. Chicago, Ill.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

IMMEDIATE SHIPMENT

Sturtevant Crushers as follows:
Jaw; 12x26 in.; 6x20 in.; 2x6 in.
Rock Emery, vertical 30 and 36 in.
Roll 36x16 in.; 20x14 in.; 8x5 in.
Rotary Fine; No. 00, 1, 2, and 3.
Ring Roll; No. 1, 2, 2 Duplex.
Hardinge 4½ ft. and 3 ft. Ball Mills.
Hardinge 8 ft. x 22 in. Pebble Mills.
Telsmith No. 5 Intermediate Breaker.
Gyratories; Nos. 3, 5, 6, 7½, and 8.
Tube mills; 5x22 ft. and 6x16 ft.
Direct Heat Rotary Dryers; 3½x30 ft., 4x30 ft., 5½x50 ft., 6x40 ft. and others.
Vulcan 6x120 ft. Rotary Kilns.
Ruggles-Coles and Christie Rotary Dryers.
Raymond Kent and Fuller Mills.
Swing Hammer Mills, all makes.
Crushers of all sizes and types.

High Grade New and Used Machinery for the Entire Rock Products and Non-Metallic Mineral Industry Our Specialty

American Machinery Equipment Co., Charlotte, North Carolina

WANT TO BUY

One No. 21 Gyratory Crusher
One No. 18 Gyratory Crusher

Equipment Sales Company
Nashville, Tenn.

"If we don't have it we will get it."

FOR SALE

1—4½'x30' American Process Dryer.
1—10½" x 12" Brown, Double Drum Steam Hoist.

Consolidated Products Co.
15 Park Row, New York City

WANTED

1—100 ton track scale
1—No. 2 crusher
1200 feet 20 lb. narrow gauge track
6—1½ yd. rocker dump cars

Petersen Sand & Gravel Co.
3240 North California Ave., Chicago, Ill.

FOR SALE

One 14x18 Erie Automatic Tangy Engine, one heater and 50 ft. of 4½" piping.

The North Indiana Brick Co.
Michigan City, Indiana

Used Crusher Bargains

36-in. Symons Disc, lot extra parts	$2200
Two No. 4 Williams Jumbo, 24x28½ in., each	1550
No. 5 McCully Gyratory	1650
No. 5 Champion Jaw Crusher	900

Locations and details on request

CHARLES EARL CURRIE & CO.
Ashland, Alabama

FOR SALE

One new 6 ft. x 6 ft. x 10 ft. Patch Gang Saw, complete with pump.

Address Box 1677, care of Rock Products
542 South Dearborn St., Chicago, Illinois

3—6x24 ft. Heavy Duty Tube Mills, silex lining, unused.

Address
Box 1680, care of Rock Products
542 S. Dearborn St., Chicago, Ill.

FOR SALE

5 5x6x7x110' Rotary KILNS.
5 5x21' Tube Mills (1 has Silax Lining, 3 Steel Lining, 1 without Lining).
2 No. 8 Ball Mills.
1 4x40' Coal Dryer.
1 No. 6 Gates Crusher.
2 5½x22' Smidth Tube Mills.
2 No. 66 Smidth Kominuters.
2 6x60' Rotary Dryers.
1 Lathe, 26" Swing, 16' Bed.
2 Automatic Weighing Machines.
3 Roll Leather Belting, 3-ply, 46"x 242'. And lot of Miscellaneous Equipment.

ENGINEERING SALES COMPANY
Stockertown, Pa.

For Sale—Steam Shovel

We own and offer for sale 1 Bucyrus Steam Shovel with 1¾ yd. dipper, mounted on standard R. R. trucks. This shovel has had but little service and is in first class operating condition and ready for work. A splendid machine, priced reasonable, as we have no further use for it. Immediate delivery.

Bodine Stone Co., Buffalo Station, Va.

2—7½D Gates Gyratory Crushers; regular drive; manganese fitted; first class condition; immediate shipment

3—150 HP. Kewanee Fire Box Boilers; 125 lb. pressure, in Indiana

ARTHUR S. PARTRIDGE
415 Pine St. St. Louis

CRUSHER

One 24x48 Buchanan Jaw, Manganese Fitted, in best of condition ready to ship from Jersey City, New Jersey, at one-third new price, including large quantity of brand new spare parts.

T. H. Letson Company
46 Church Street New York City

FOR SALE

One 6 by 8 Sturtevant Newaygo Separating Screen, all complete.
One Ring Single Roll Crusher in first-class condition.
Full information on request. Address

P. O. Box 1682, Care Rock Products
542 South Dearborn Street, Chicago, Illinois

Erie Pump Bargain

New, never used, 8 inch heavy duty. Write for bargain price.

STROUD & CO.
Omaha, Nebr.

Laboratory Pulverizer

For Sale

Braun Type Pulverizer, in good serviceable condition. Address for price and photo view

N. L. Hall, P. O. Box 282, La Salle, Ill.

WANTED

Two-yard Page drag line bucket, complete, of late model, in first-class condition. Wire price and inspection point.

DIXIE SAND & GRAVEL CORP.
Petersburg, Va.

Mine Cars, Rails and Locomotives

We have a number of good, serviceable, standard gauge, second hand locomotives, and narrow gauged ones, for immediate shipment.

M. K. FRANK
Frick Building Pittsburgh, Pa.

Classified Advertising

Rates for advertising in the Classified Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

Business Opportunity

Parties owning a very large and valuable deposit of high grade rock-gypsum or alabaster, desire to secure capital and experienced management to organize a company for its development. For further particulars address

Box 1679, care of Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

Steam shovel engineer and cranesman for quarry work, central New York state. Bucyrus 70-C. State experience and wages expected and also concerns for whom you have worked. Prompt answer.

P. O. Box 773, Albany, N. Y.

POSITION WANTED

An experienced cement manufacturer, technically and commercially trained in all details of financing, operating and selling, desires suitable connection. If interested full information will be furnished.

Address P. M. 200, care Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

Working superintendent for a lime plant in Massachusetts. Must be a good executive and have thorough knowledge of lime burning, rock crushing and general machinery used in the business. Apply with full particulars.

Box 1670, Care of Rock Products
542 South Dearborn Street Chicago, Ill.

Position Wanted

as Manager, General Superintendent or other position of responsibility. Long, practical experience with large operations in both construction and operation. Intimate acquaintance with most types of machinery, both plant and quarry. Good mechanical and executive ability. Address

Box 1681, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

WANTED

Superintendent for crushed gravel plant. State experience, references, age and salary when making reply.

Address Box 1675, care of Rock Products
542 South Dearborn St., Chicago, Illinois

Experienced Manager

Open pit or underground quarry superintendent or manager open for employment August 1. Fifteen years' experience. Best references. Nominal salary with share in profits produced.

Address Box 1678, care of Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

Personal assistant to operating engineer, technical graduate preferred, experienced in position of some authority with quarry and stone-crushing or similar operations. Give full experience and salary desired. Address

Box 1674, care of Rock Products
542 South Dearborn Street Chicago, Illinois

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

IDEAS—

You could use an idea now and then, couldn't you?
You'll find plenty of new ones, short cuts and time savers in ROCK PRODUCTS.

Our traveling editors are running around, dropping in here and there finding out just how things are done, and then they tell you how the other fellow makes things hum.

Practical stuff—tested ideas—something *you* can use
Better fill out the blank and mail it to us today

ROCK PRODUCTS Date.....1922
542 So. Dearborn St., Chicago, Ill.

Please enter my subscription to ROCK PRODUCTS for.....year.... (one year $2.00, two years $3.00—please state which. You save a dollar by subscribing for two years), for which we enclose $..... Canadian and Foreign Subscriptions $3.00 a year.

Name.....

Street.....

City.....State.....

We produce:.....

.....

.....

We retail.....

INDEX TO ADVERTISEMENTS

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

Published Every Other Saturday by

Tradepress Publishing Corporation

542 South Dearborn Street, Chicago, Illinois

MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President GEO. P. MILLER, Treasurer
N. C. ROCKWOOD, Vice-President C. O. NELSON, Secretary

NATHAN C. ROCKWOOD, Editor and Manager
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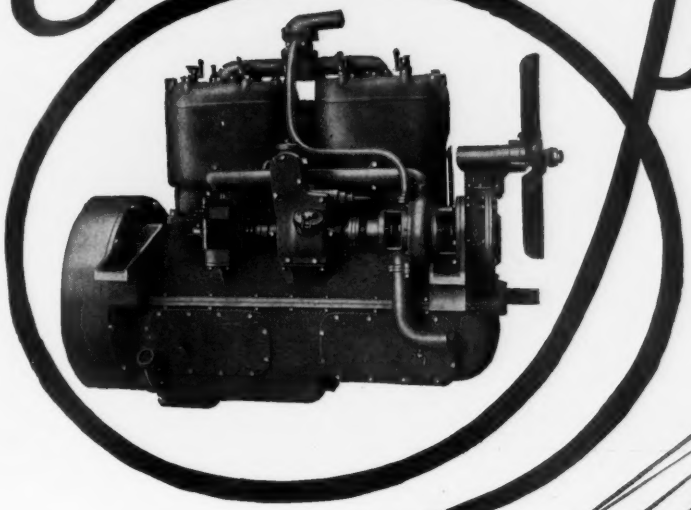
SUBSCRIPTION—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

TO SUBSCRIBERS—Date on wrappers indicates issues with which your subscription expires. In writing to have address changed, give old as well as new address.

Volume 26 July 28, 1923 Number 15

CONTENTS

Gasoline Power!



Others will follow in Northwest's Footsteps—

NOW that the NORTHWEST has demonstrated its superior operation, it is said that a number of engineers are experimenting in an effort to build a gas shovel that will meet the simplicity of the Patented NORTHWEST.

This shows that other manufacturers are following in NORTHWEST'S footsteps.

NORTHWEST ENGINEERING CO., 1234 Steger Building, Chicago

NORTHWEST

GAS or CRANES · SHOVELS · DRAGLINES ELECTRIC

Every Kind of Work

WINTER put in overtime this year, but the Lutz Stone Company, Oshkosh, Wisconsin, kept their Thew busy in spite of the ice in the pit and frost in the ground.

For one thing, they built a new crusher plant. This meant foundation excavations and filling work for the shovel. In addition, there was last season's stock pile to be cleaned up.

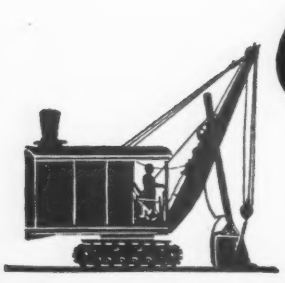
Odd jobs between seasons keep down equipment overhead, and the Thew electric is the ideal shovel for winter work. No steam to bother with; no watchman needed. Lock it up and go home at night. In the morning just throw the switch and get busy.

Cheaper than steam, too. This is true all year around. Current costs less than fuel and the maintenance item of the electric shovel is negligible.

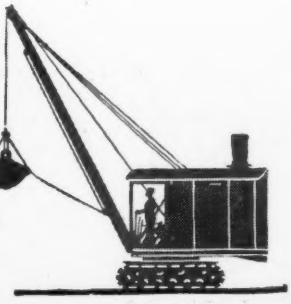
Now that the season is in full swing, this Thew is busy down in the pit loading rock for the crusher plant it helped to build.

Write for Bulletin 201 on the all year around electric.

THE THEW SHOVEL CO., LORAIN, OHIO



Thew Power Shovels



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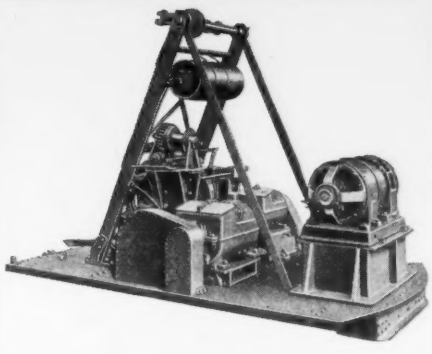


Construction Similar to Steam Shovel

One of the outstanding features of Marion Electric Revolving Shovels is the similarity of construction with our standard steam machines. Many parts regularly used on the steam shovels are retained on the electric outfits.

The motors, being series wound, have high speed at light loads, and slow speed at heavy loads, characteristics that are also found in steam shovels and have much to do with their success. **These features cannot be obtained on friction operated machines where the power is obtained from a single prime mover.** The control levers have movements identical with the steam machines and any operator, familiar with the handling of a steam shovel, can understand and operate this new type.

PURR R-R-R!

That's about all the sound you hear around a Marion Electric Revolving Shovel. Of course there is the traveling of the dipper in and out, the hum of the motors, and the familiar sound of the digging and rotating movements. But, all in all, it is quite different from the noise and dirt incidental to the operation of a steam shovel.

Where line current is available at reasonable cost; where fuel is expensive or difficult to get; where noise and dirt are objectionable, there is no type of excavator as desirable as a Marion Electric Shovel.

Independent Three Motor Drive

The three major movements—hoisting, rotating and crowding—are each independent, a design very much different from single motor machines. With this design Marion eliminates troublesome frictions, brakes and clutches, and approximates the construction and operation of the well established steam machines.

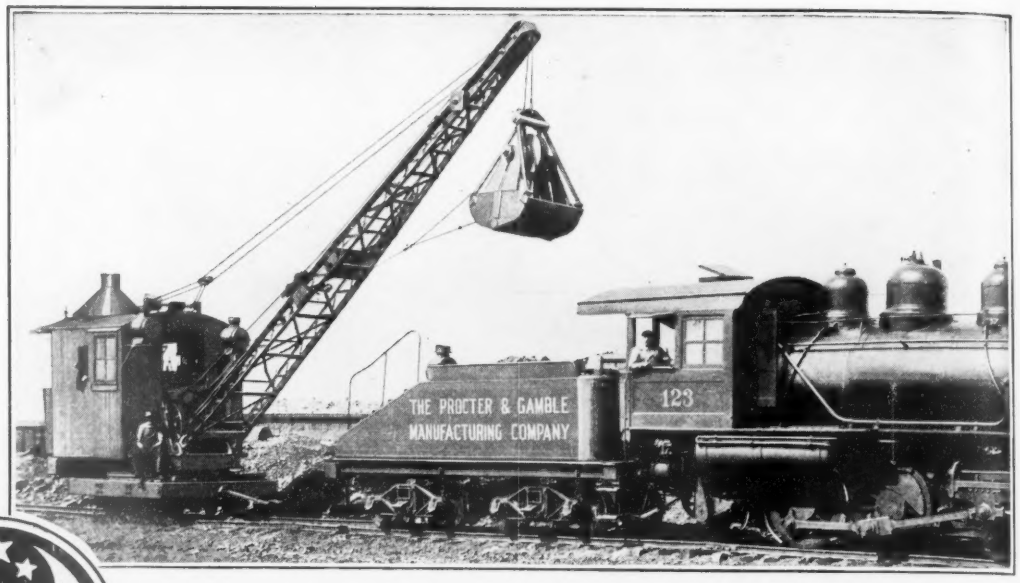
If you are interested in electric excavators you will want to know more about Marion Power Shovels. Ask for Bulletin A–301 and let us have our representative call and show you where substantial savings can be effected.

280

The Marion Steam Shovel Company

Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy



Browning and Ivory Soap

99 44/100% pure! It Floats.

EITHER phrase instantly calls to mind Ivory Soap—the soap that, for two generations, has befriended the faces and fabrics of millions.

The experience of forty-four years coupled with the most efficient production methods enables The Proctor & Gamble Company to give the public, at a reasonable cost, a soap that has secured the unlimited confidence of the public.

In the economical production of Proctor & Gamble products a Browning Locomotive Crane plays a prominent part. In handling coal and other heavy materials the Browning Crane effects worth-while savings that are a factor in bringing to the public "the Soap with the Seven Essentials."

Whether *your* plant be large or small, if there is heavy material to be handled a Browning Locomotive Crane will accomplish savings for you just as surely as it has for Proctor & Gamble and dozens of other nationally known manufacturers.

Let our engineers study your needs (without obligation) and tell you frankly if a Browning can serve you profitably

THE BROWNING COMPANY

New York **CLEVELAND, OHIO, U. S. A.** **Chicago**

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BROWNING

LOCOMOTIVE CRANES

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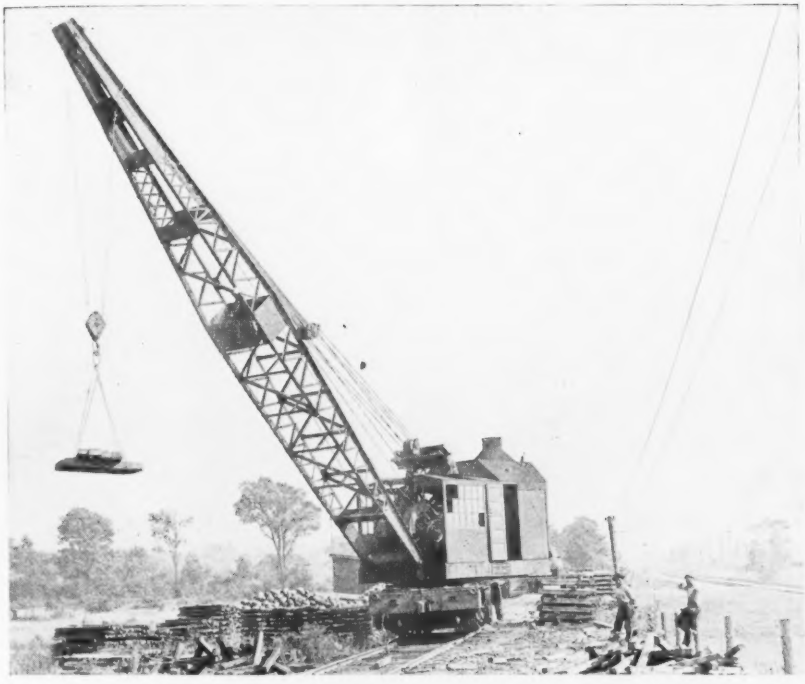
For Power and Speed—



McMyler-Interstate No. 6

SPECIFICATIONS

30 tons capacity
50 - 70-ft sectional boom
Single line pull, main hoist, 15,000 lbs.
Single line pull, auxiliary hoist, 10,000 lbs.
Hoisting speed, 225 ft. per min.
Travel speed, 300 ft. per min.
Tractive effort, 11,000 lbs.
6-in. x 11-in. journals
60-in. boiler
Complete outriggers
Locomotive type air brakes, acting on all eight wheels, Westinghouse compressor

Number Six is built for heavy duty,—but it is quick in its movements. It handles easily and the operator stands where he can watch his work.

With a 2-yd. bucket on the 70-ft. boom, it will store and reclaim coal over a wide area.

If there are piles to drive, use the No. 10 attachment. One of these machines on a grade elimination job at Cleveland is averaging easily ten 15-inch piles per hour, driving to a depth of 15 feet, including time for placing.

Plenty of room for a 10-k.w. generator set for magnet work.

Readily adapted for dragline scraper work.

And it will handle a 30-ton fall block on the main hoist and a 5-ton fall block on the auxiliary.

Locomotive Cranes · Car Dumpers · Coal and Ore Handling Machinery · Forgings
Clam Shell Buckets · Pile Drivers · Railroad Equipment · Cargo Handling Equipment

THE McMYLER-INTERSTATE CO. CLEVELAND

NEW YORK CHICAGO PITTSBURGH DETROIT

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I'm Looking for a Job

—and I'm a "bear for work." My full name is "Link-Belt Portable Conveyor," but they call me "The Cub" for short.

Just show me the pile of coal, sand, gravel or other loose material that you want to load on to trucks or cars and I'll set a new record for fast work.

I'll work 8, 12 or 24 hours a day if you want me to. I never go on strike, never take a day off nor ask for more pay. In fact my price is less than it used to be (see note).

If you want to know more about me and my big brothers ask for booklet on "Link-Belt Portable Loaders".

1294

NOTE: Owing to the greatly increased demand for a small portable conveyor we have been able to bring production to a point that permits of lower prices. You can buy "The Cub" now for $585, instead of $700. At this new price even the smallest coal yard, manufacturing plant, mill or factory, handling a small amount of material, can afford to use this mechanical loader. In fact you lose money by not having one.

LINK-BELT COMPANY, NICETOWN, PHILADELPHIA, PA.

Please send me your illustrated book of Link-Belt Loaders, showing all types, sizes and capacities.

Name _____ Firm _____

Address _____ Town _____ State _____

Rock Products

LINK-BELT

When writing advertisers please mention ROCK PRODUCTS

Save 14c Per Ton Loading With the Jeffrey Portable Belt Conveyor

One man and a Jeffrey "Portable" can load a 5-ton truck in 10 minutes. Doing this work by hand takes 3 men 40 minutes. Figuring then the cost of labor at 40c. per hour, the conveyor will load at a cost of 2c. per ton against 16c. per ton by hand, or an average saving of 14c. on each ton loaded, and in addition a half hour's time of truck and driver is saved.

A Few of the Important Features:

Easily operated Worm and Wheel Raising and Lowering Device automatically locks conveyor in any position.

Troughed Belt carries gritty material without injury to belt.

Strong, sharp Nose can be readily thrust into pile.

Steel Guard Plates protect lower strand of belt.

Chain Guard protects high-speed chain.

A light, rugged and inexpensive conveyor which will load, reclaim or store coal, coke, sand, gravel, crushed stone and smaller materials—unload cars—handle bricks, tile, small boxes and bags.

Write for further information and prices

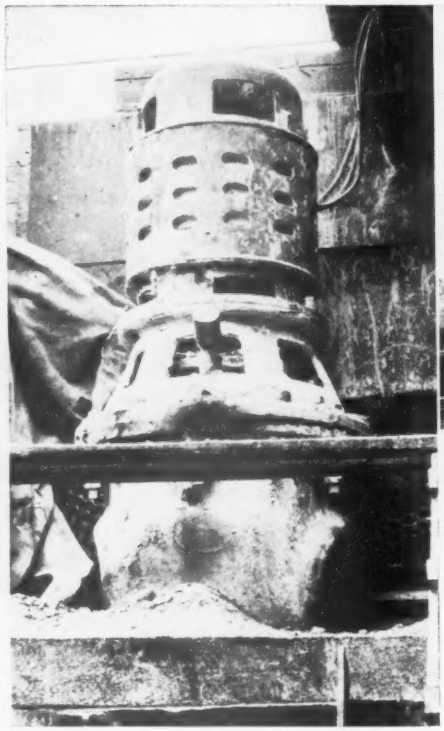
The Jeffrey Mfg. Co., 935-99 North Fourth Street **Columbus, Ohio**

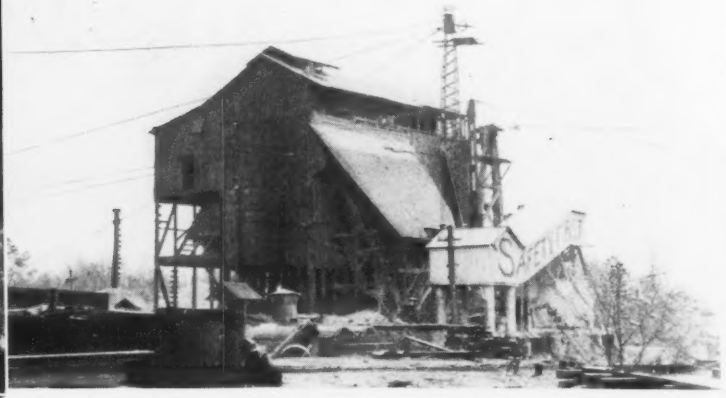
New York, 2008 Hudson Terminal Bldg. Chicago, 858 McCormick Bldg. Pittsburgh, Rea Bldg., 622 Second Ave. Montreal, Canada, Power Bldg.
Philadelphia—515 Real Estate Trust Bldg.

Locations of Other Jeffrey Sales Representatives

Cleveland, Ohio	1519 Guardian Bldg.	Milwaukee, Wis.	M. & M. Bldg.
Denver, Colo.	1751 Wazee Street	Boston, Mass.	141 Milk Street
St. Louis, Mo.	606 Pontiac Bldg.	Los Angeles, Cal.	H. W. Hellman Bldg.
Detroit, Mich.	455 Book Bldg.	Charleston, W. Va.	914 Kanawha Street
Scranton, Pa.	518 Union Nat'l Bank Bldg.		

JEFFREY

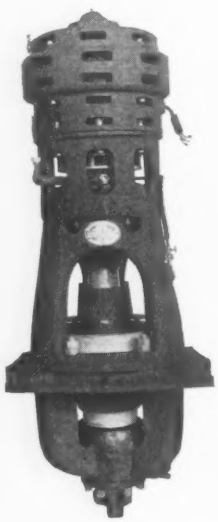




A WESTON
Direct Drive Gyratory Crusher Installation

The No. 36-A Weston Direct-Drive Gyratory Crusher driven by a 75-hp. motor was installed in August, 1921. Since that time it has crushed more than 400,000 tons of granite, and no repairs have been necessary.

This installation has demonstrated convincingly the Weston's remarkable capacity, low power consumption, general economy in operation, and ease of adjustment.



The Weston is constructed of steel; has chrome-vanadium forged steel shaft of large size, with full-bearing eccentric, bronze-bushed inside and out.

It is equipped with a sturdy oversize motor; positive lubrication without pumps is provided; and bearings are dust-tight.

The design is simple and is built in six standard sizes to follow any primary.

Arranged for direct-motor or belt drive.

Send for our bulletin No. 25-A. It contains a complete, detailed description of this universal machine.

THE MORGAN ENGINEERING COMPANY
ALLIANCE, OHIO

Los Angeles
Rosenburg & Co.

Chicago
122 S. Michigan Ave.

Designers, Manufacturers and Contractors
Electric Traveling Cranes, Rolling Mill Machinery
Ordnance, Steel, Shipbuilding and Forging Plants Complete
Rock Crushers, Special Machinery for Any Purpose

New York
120 Broadway

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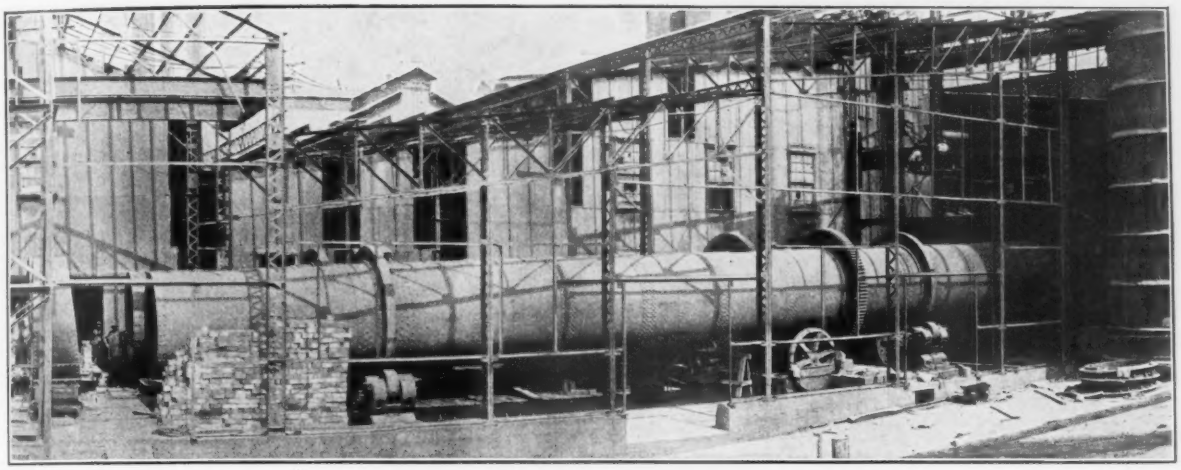
Garfield & Co.

Traylor Rotary Kilns



2—8′x100′ Traylor Rotary Cement Kilns
Dexter Portland Cement Co.
Nazareth, Pa.

TRAYLOR ROTARY CEMENT KILNS are carefully designed, ruggedly built, rigidly inspected and assembled in our shops before shipment—they are the sort of equipment that gives maximum service **under the extremely** severe conditions developed in burning cement clinker.

A careful study of our specification and design will quickly show why Alpha P. C. Co., Dexter P. C. Co., Monolith P. C. Co., New Egyptian P. C. Co., Penn-Allen P. C. Co., Universal P. C. Co. purchased Traylor Kilns.

Traylor Kilns are built in any diameter and length, with two, three or four supports. Complete data will be furnished by the nearest Traylor man.

TRAYLOR
ENGINEERING AND MFG. CO.
ALLENTOWN, PA.

NEW YORK 30 Church St. | PITTSBURGH 1203 Fulton Bldg. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES I. W. Hellman Bldg. | SEATTLE 815 Alaska Bldg. | SALT LAKE CITY 101 W. 2nd South St. | LAREDO, TEXAS 1806 Farragut Ave.

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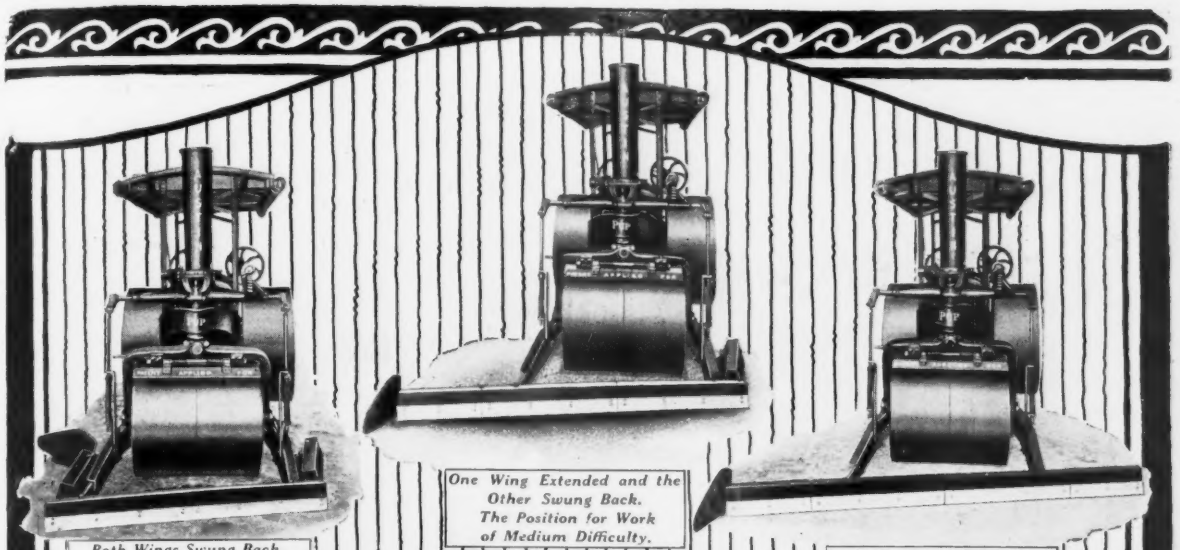
Export Department, 104 Pearl Street, New York City—Cable Address "Forsaltra"

International Machy. Co., Santiago, Chile **W. R. Grace & Co., Lima, Peru** **International Machy. Co., Rio de Janeiro, Brazil**



Both Wings Swung Back. The Position for Difficult Work

One Wing Extended and the Other Swung Back. The Position for Work of Medium Difficulty.

Both Wings Extended. The Position for Easy Work

The AUSTIN PUP

ROAD MAINTAINER and ROLLER

THE ability, because of its adjustable blade length and height, to do work of such a difficult nature that other maintainers and light graders could not hope to touch it, is one of the chief features of the Austin Pup.

Light, handy roller, scarifier and tractor as well,—is it any wonder that the 3 to 4-ton Pup has become a universal favorite with contractors, public officials and other users, almost overnight?

A copy of the latest special Pup catalog that tells the whole story is yours for the asking.

The Austin-Western Road Machinery Co.

Home Office: Chicago

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A "FORD" in the Pump Field

For Low Cost and Big Capacity You Can't Beat the EVINRUDE

ANY man who has ever owned an Evinrude Centrifugal Pump will back up that statement, regardless of the use he has made of it. For there's not another pump on the market with a capacity of 5,000 gallons at a 20-foot head that costs so little to operate and is so reasonably priced.

Light and compact, the Evinrude is the handiest, most adaptable pumping outfit made. Weighing only 115 pounds, it is easily moved by two men. Occupying a space only 16″x23″, it may be lowered into ditch, caisson or excavation and submerged in the water. A 2 H. P. built-in, gasoline engine, the very one now used in 150,000 Evinrude rowboat motors, supplies the power. No need for any "installation." An Evinrude may be used with or without a suction line.

Every day someone discovers a new use for this powerful little pump. Sewer contractors find it a life-saver for working in close quarters. Roadbuilders use it for supplying water to their mixers in cases of emergency. After a rain, it is the contractor's best friend for clearing the water out of his building excavations.

Many Evinrudes are used in quarries, gravel pits and mines to dispose of drainage water. Bridge builders find them very efficient for emptying coffer dams. Street railway and public service companies buy them for their underground work. Because of its quick action and compactness the Evinrude is an ideal priming pump for the larger centrifugal pumps with which sand dredges are equipped.

If you have a pumping problem, requiring a small outfit of the Evinrude capacity, write for our literature describing and illustrating the many ways in which this pump is now serving.

Dealers: Write for our proposition. Some very desirable territory is still available

EVINRUDE MOTOR COMPANY
80 Lake Street **Milwaukee, Wis.**

5000 GALLONS per hour at 20 ft. head

Exhibited at Road Show, Chicago

EVINRUDE CENTRIFUGAL PUMP

DISTRIBUTORS:
69 Cortlandt Street, New York, N. Y.
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119 Broadway, Oakland, Calif.
211 Morrison Street, Portland, Oregon

Price: $150.00 F.O.B. MILWAUKEE

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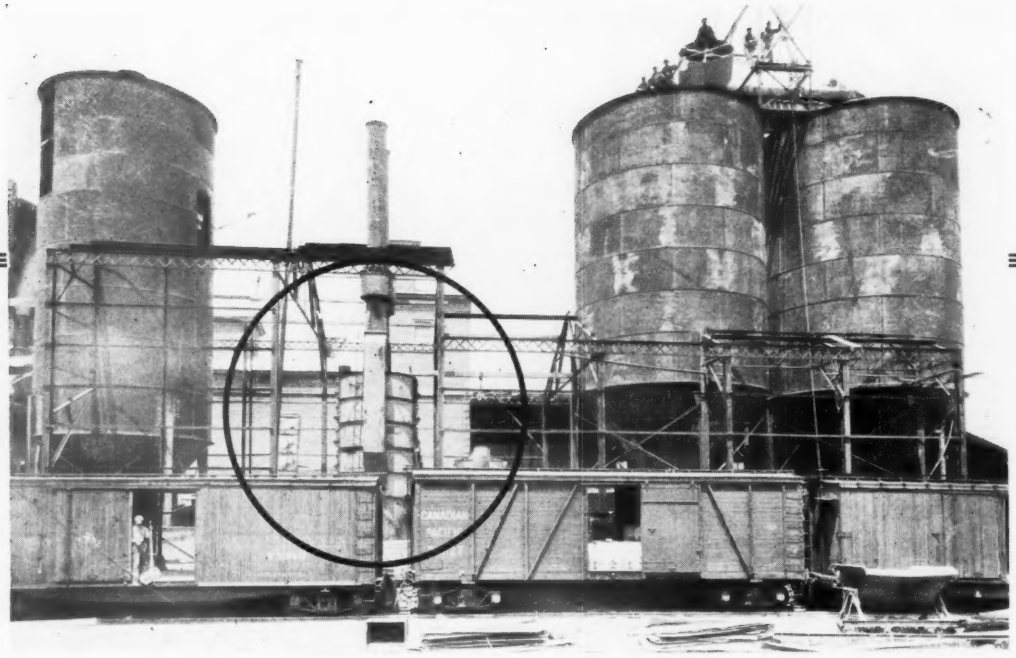

The Schaffer Hydrator
at the
Palmer Lime & Cement Co. Plant

The engraving shown above illustrates the installation of a Schaffer Hydrator at the new hydrate plant operated by the Palmer Lime and Cement Co., York, Pa.

In the design and construction of this plant advantage was taken of successful operating ideas developed by other companies, and several new ideas have been incorporated that promise to make this the most modern as well as one of the really efficient lime plants of the country.

The dependability and long unimpaired service that is so characteristic of the Schaffer Hydrator, together with the automatic features that practically eliminate the labor problem, made the installation of this machine a desirable addition to the efficiency of the plant.

A Schaffer installation in a plant of this kind is a responsibility which is thoroughly appreciated.

Schaffer Engineering & Equipment Co.

2828 Smallman Street **Pittsburgh, Pennsylvania**